PHILIPPINE ZOOLOGICAL EXPEDITION

1946-1947

TABANIDAE (DIPTERA)

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The Philippine Expedition: Tabanidae (Diptera)[1]

INTRODUCTION

The following report is based on horseflies and deerflies collected by the Philippine Zoological Expedition of Chicago Natural History Museum (CNHM), on some additional Philippine material in the United States National Museum (USNM) examined through the courtesy of Dr. Alan Stone, and other material collected by Dr. L. E. Rozeboom (LER) and myself (CBP) on those islands. A few specimens were also furnished from the collections of the California Academy of Sciences (CAS), the Museum of Comparative Zoology (MCZ), the British Museum (Natural History) (BMNH), and Dr. L. L. Pechuman (LLP). Locations of respective types and other specimens are indicated in text by the appropriate initials above. Thanks are particularly due Drs. C. C. Alexander and I. M. Mackerras and Mr. R. L. Wenzel for suggestions and criticisms during the preparation of this review. In addition, through a grant from the Marsh Fund of the National Academy of Sciences, I was privileged to study pertinent types in BMNH, Museum d'Histoire Naturelle, Paris, and Natura Artis Magistra Museum, Amsterdam (NAM) through the courtesy of H. Oldroyd, E. Sèguy, and C. A. W. Jeekel.

Previous records for the Philippines have been surprisingly few. The first, *Diabasis flavipennis* Macquart, is now questioned as discussed hereafter. Osten Sacken (1882) lists *Chrysops signifera* (=*C. cincta*) and *C. dispar*, two undescribed species of *Chrysozona*, *Tabanus striatus* and two striking new species, *T. ixion* and *T. vanderwulpi*. To these, Schuurmans Stekhoven (1926) added *T. factiosus* (via Ricardo), *T. reducens*, and (1932) *T. effilatus* and *T. 5-triangularis*. The present report can hardly qualify as a monograph because of the modest number of specimens studied, but it adds *Cydistomyia longirostris* and six new species of that genus, three new species of *Chrysozona*, *Tabanus ceylonicus*, *T. jucundus*, *T. immanis*, *T. dissimilis*, and

[1] Contribution from the United States Department of Health, Education and Welfare, Public Health Service, National Institutes of Health, National Institute of Allergy and Infectious Diseases.

an astonishing 26 new species of *Tabanus*. This makes a total[1] of 50 Tabanidae reported from the Philippine Islands, which number could probably be doubled eventually, with adequate collecting. Bezzi (1913) relisted but did not add to the total known at the time.

Literature on Far Eastern and East Indian Tabanidae is considerable, but it is difficult to assess and the keys too frequently are dependent on extensive, representative material. For this reason, I have provided keys to the tabanid fauna of the Archipelago even though it is incompletely known. I have full sympathy for Osten Sacken's (op. cit.) early reluctance to describe Philippine species because of the need for laborious consultation of many descriptions of oriental species. Future collecting of Philippine tabanids should be very rewarding. Though the islands are poor in genera, they are obviously rich in species.

ORIGINS OF THE FAUNA

The Southwest Pacific has long been a favorite area among biogeographers, ecologists, and evolutionists concerned with historic and systematic biology. That the Philippine Archipelago occupies a strategic position in the region is emphasized in the scholarly review of geologic, hydrographic, and biologic evidence by Dickerson (1928) and his collaborators. They revised Wallace's Line northward, including the Archipelago proper but separating it from Palawan on the west and from Taiwan on the north, thus forming with the Celebes and other islands to the south a biologic zone which they called "Wallacea." This is bounded on the east by Weber's Line, thus encompassing an important transition zone between the Oriental and Australasian Regions, as called to my attention by Alexander, who has described some 450 species of Tipulidae from the Philippines. Darlington (1957) states that "The islands and water gaps of Wallacea form a subtraction-transition area and partial barrier between the Oriental and Australian faunas." Inger (1954) has also discussed the zoogeographic influence of Malaysia on the amphibian fauna of the Philippines.

As further regards insects, Dickerson (1928) cites and supports, on a much broader basis, Shelford's view, based on distribution of certain oriental cockroaches (Prosoplecta), ". . . that if the Philippines are to be regarded as a part of the Indo-Malayan Region, their

[1] After this review was in proof, I discovered a neglected reference by Kröber (1924) on Philippine Tabanidae, which adds five described and two new species to the above, though these are ascribed to "Philippinen" without localities. These forms could not be included in the keys below, but are discussed and differentiated at appropriate places in the text and in the Addendum.

separation from adjacent land is of very great antiquity." Dickerson emphasizes an important Early Tertiary horizon called the "Vigo-Miocene" when it was probable that the Philippines had southerly connections with Indonesia (at least from Mindanao through Sulu to Celebes, and Palawan to Borneo), but further, that separation took place to the south and from Palawan before the latter became an island. This accounts for a present-day survival on that island of many Bornean elements not found on the adjacent islands to the east. The peculiar *Cydistomyia longirostris* Sch. Stek., discussed later, is a good example among Tabanidae. The ancestors of other rather primitive *Cydistomyia* species, described below, undoubtedly migrated from the south, where the genus is much more elaborated, and their precursors probably radiated along a southern pathway in more ancient times (see Mackerras, 1954, and Oldroyd, 1957), since Mackerras postulates establishment of several well-defined tabanid elements as early as the mid-Mesozoic.

Dickerson also provides strong geologic and biologic evidence that there was a prior northern land connection with Asia before the Vigo-Miocene age, probably through Formosa or China, to account for Asiatic-like floral and faunal remnants on the highlands of Luzon after the intervening land connections had been drowned. He states: "A residual flora, chiefly Himalayan in origin, and a residual insect fauna of Asiatic temperate regions have thus been preserved in this wonderful [Luzon] upland, but their southern migration has been limited by the excessive temperature of the lowlands." "There seem definitely to have been two routes of migration of Asiatic types into Malaysia; one through the Malay Peninsula and Sumatra to Java and Borneo, and one through Formosa and the Philippines into eastern Malaysia."

It is likely that the tabanid precursors of Philippine *Chrysozona* and of such elements on Luzon highlands as *Tabanus alticolus* and *T. baguiensis* were of this type of very early northern derivation. On the other hand, while *Chrysops* undoubtedly had its early, most active radiation from the northern hemisphere through Asia (as did also *Chrysozona*), *C. signifera*, probably, and *C. dispar*, possibly, both moved in later from the south, as undoubtedly did *Tabanus ceylonicus*. Rather primitive elements of the genus *Silvius* appeared in China and moved into Taiwan (Philip and Mackerras, in press) apparently after separation of Luzon took place. It is interesting that while a few of the more primitive pangoniines have reached New Guinea, Australia, and even New Caledonia and New Zealand, either via the Lemurian arc through India and the Malay Peninsula or by ancient

"Antarctic radiation," only one uncertain species has been taken thus far in the Philippines (see Mackerras, 1954, 1957, and p. 619).

The present all too fragmentary review of Philippine Tabanidae bears out Dickerson's further observation that "the Philippine insect fauna presents a high percentage of endemic elements, and thus the relatively great antiquity of the present fauna is demonstrated." In the subfamily of grasshoppers, Tetriginae, 97 of 104 species listed at that time (1928) were "endemic" (precinctive), and of 612 listed species of butterflies, which have been the most adequately sampled of the insect fauna, 55 per cent in Palawan were endemic, 32 per cent in Mindanao and 25 per cent in Luzon. This prolonged biotic isolation is also supported by Alexander's observations on the craneflies; he writes that the higher altitudes "in the mountains of the Philippines and Indonesia support their own tipulid faunas." The separation of the Philippines into faunal isolates is remarkable and tempers my misgivings at finding so many, apparently undescribed Tabanidae from different islands in the relatively small collections studied. Several of the new species described herein are from mountains on Luzon or Mindanao.

Precinctive speciation must have been in progress here for a very long time. This is evidenced even in the eye patterns; for example, a single wide, bluish-purple band on a green ground shows up in many Philippine *Tabanus* otherwise closely related to the common East Indian *immanis-fumifer* complex, which species possess eyes blue-green on the lower half, sharply purple above. To determine whether differences in the eye pattern indicate group specific differences will require study of considerable fresh material.

Since the samples are so obviously incomplete, it is too early to speculate on any significant zoogeographic evidence that the Tabanidae can contribute to the over-all historic record in the Archipelago. But it is hoped that the records below will contribute to the conclusions of a future reviewer and will stimulate further collecting in this family of parasitic flies, members of which are economically important, for they transmit the grave livestock disease, surra (see pp. 608–609).

SYSTEMATIC DISCUSSION

KEY TO PHILIPPINE GENERA OF TABANIDAE

1. Third segments (flagellums) of antennae 6- to 8-annulate, without an elongate basal plate; hind tibiae with paired apical spurs.
[subfamily Pangoniinae; *?Scaptia* sp., see p. 619]

Flagellums with basal plate usually at least as long as terminal 3 to 4 annuli together; apical, hind-tibial spines present only in *Chrysops* 2

2. Three functional ocelli present on vertex; antennae slender or cylindrical, the first (scape) and second (pedicel) segments elongated, subequal in length; wings with sharply contrasting dark bands (subfamily Chrysopinae). *Chrysops* Meigen

Ocelli infrequent and non-functional; antennae only occasionally slender and then the two basal segments short or the pedicel half (or much less) the length of the scape; if wings sharply banded, specimens are large, over 15 mm. (subfamily Tabaninae) 3

3. Wings gray or brown tinted with pale spots, wavy lines and rosettes; antennal scapes long and cylindrical, over 4 times longer than pedicels, and subequal to flagellums; tibiae ringed with white; fronts (♀) but little narrower than tall . . . . . *Chrysozona* Meigen

Not with this combination of characters, fronts (♀) much narrower, at least 3 times taller than wide 4

4. Subepaulets (basicostas) at base of wings bare . . . . . *Cydistomyia* Taylor

Subepaulets with coarse, bristly hairs (seldom only a few) like those on the adjoining costal vein . . . . . *Tabanus* Linnaeus

Genus **Chrysops** Meigen

Chrysops Meigen, 1800, Nouv. class. mouches à deux ailes, p. 23.

In a major revision of the supraspecific taxa of the family and guided by new information in comparative studies of genitalia, Mackerras (1954) has transferred this group of flies from the old subfamily Pangoniinae to a new subfamily of its own, the Chrysopinae. Dr. C. W. Sabrosky (in letter) has further called attention to a possible confusion here with a taxon that may eventually be derived from the neuropteran genus *Chrysopa*, and he has suggested that it might be desirable to adopt the subfamily name Chrysopsinae for this tabanid group and thus preclude any future ambiguity. The present report, however, is not the place to propose this systematic change.

Mackerras has correctly pointed out that the phylogenetic position of *Chrysops* is closer to that of the specialized Tabaninae than to that of the more primitive Pangoniinae. The genus is most developed in the northern hemisphere. Only two species are known definitely from the Philippines, where they are seldom encountered.

KEY TO PHILIPPINE SPECIES OF *CHRYSOPS*

Abdomen with an inverted black V; tibiae yellow and normal; crossband forked on hind margin of wings . . . . . *dispar* (Fabricius)

Abdomen with two prominent black bands across the middle; crossband solid at hind margin; tibiae dark brown and distinctly swollen . . . . . *signifera* Walker

Chrysops signifera Walker

Chrysops signifer Walker, 1861, Proc. Linn. Soc. London, **5**: 276—"Batchian" Is.; Osten Sacken, 1882, Berlin. Ent. Zeitschr., **26**: 97; Schuurmans Stekhoven, 1926, Treubia, **6**: 43; 1928, Zool. Jahrb., Abt. Syst., **54**: 425.

Chrysops cinctus Bigot, 1892, Mem. Soc. Zool. France, **5**: 602—Philippines.

Osten Sacken (loc. cit.) reported both sexes from the Philippines. Schuurmans Stekhoven (loc. cit.) decided that *C. cinctus*, described from the Philippine Islands, and *C. clavicrus* Thompson from Malacca were not synonyms. Comparison of the pair listed below from Samar leaves little doubt that *C. cinctus* is a synonym. It appears not unlikely that *C. clavicrus* and *C. atrisignatus* Schuurmans Stekhoven from Celebes are also variants that have less black on the abdomen, but I lack sufficient material to decide this. Kröber (1929), incidentally, reports *C. clavicrus* from Palawan.

The swollen tibiae and face, and the wing pattern and elongate antennae show this species to be related to *Psylochrysops grandis* (Szilady) of Taiwan (Formosa) and *Kleineana longicornis* (Macquart) of tropical Africa. If these are eventually considered to be even subgenerically distinct from *Chrysops*, then Enderlein's *Kleineana* will have precedence, contingent probably on whether these oriental species also have males with narrowly dichoptic eyes. However, Oldroyd (1957) believes that this character has no more than specific differential value among Ethiopian species in spite of Enderlein's emphasis on it.

In the females listed below, the front is strictly parallel and the callosity large and widely contiguous with the eye margins.

Material examined.—One female, Manila, Luzon, September 13, 1945, collected at light by C. B. Philip. Five females, Manila, 1923, collected by M. B. Mitzmain, and one male, Baguio, Luzon, March 4, 1920 (BMNH). A male and female, Samar Naval Base, March, 1945, collected by G. E. Bohart. Five males and four females, various dates in February, May, June, November, 1957, collected by W. C. Frohne at Palo, Leyte.

Remarks.—The eye pattern is fairly heavy and has the occipital border contiguous with the eye and confluent above with the upper end of the shaft and the upper frontal spot. The upper and lower spots are also contiguous with the margin. The lower extension of the arrowhead is peculiarly expanded and truncate but does not quite touch either adjacent marking. The mid-frontal spot is bilobed in front and connected with the arrowhead behind. Though the distribution and location of spots are the same as in Nearctic

species, the broad union of the upper frontal spot with the shaft and the expanded lower tip of the arrowhead are unusual.

Chrysops dispar (Fabricius)

Tabanus dispar Fabricius, 1798, Ent. Syst. Suppl., p. 567—India.

Chrysops dispar Wiedemann, 1821, Dipt. exot., p. 102, comb. nov.; Schuurmans Stekhoven, 1926, Treubia, 6, (Suppl.), p. 29.

Haematopota lunatus Gray, 1832, Griffith *in* Cuvier, Anim. Kingd., **15**: 696.

Chrysops bifasciatus Macquart, 1838, Dipt. exot., **1**: 157.

Chrysops ligatus Walker, 1848, List Dipt. Brit. Mus., **1**: 195.

Chrysops manilensis Schiner, 1868, Reise Novara Dipt., p. 104; Ricardo, 1911, Rec. Indian Mus., **4**: 377 (new synonymy).

?Chrysops semicirculus Walker, 1848, List Dipt. Brit. Mus., **1**: 196.

?Chrysops impar Rondani, 1875, Ann. Mus. Civ. Stor. Nat. Genova, **7**: 460.

Variation in this common and widespread species in the Orient has led to several synonyms. Stekhoven (loc. cit.) gives a good account of variation in both sexes and a good synonymy.

It appears probable that the neglected *C. manilensis* Schiner is synonymous. Ricardo (op. cit.) apparently studied the two cotypes, which, though in poor condition, have characters, including size, which agree here. The gray rather than yellow abdominal pattern of the type (studied on loan) agrees with the Balara specimen listed below (which is obviously more grayish because of a recent dried-blood meal), and its abdomen is similarly compressed by capture or pinning, with some resulting discoloration.

Material examined.—Females: one, Balara, Luzon, July 16, 1954, L. E. Rozeboom, in carabao trap; twelve, Selangor, Malaya, March 23, 1948, C. B. Philip; one, Seaport Estate near Kuala Lumpur, Malaya, May 2, 1948, C. B. Philip.

Remarks.—The eye pattern is very distinctive; the occipital border is narrow and, like the upper and lower spots, is contiguous with the eye margin; the bilobed frontal spot is isolated, without connection to the arrowhead, but almost touches the eye at the lower lobe; the lower extension of the arrowhead is unusually heavy and merges with the lower corners of both the occipital border and the lower frontal spot. However, the upper shaft is short and the upper frontal spot is long and does not merge with the occipital border above.

If Kröber (1929) is correct in reporting *C. flavocinctus* Ricardo from Borneo and Taiwan (Formosa), then the species may be expected to occur somewhere in the Philippines, perhaps in Palawan.

Chrysops fixissima Walker

Chrysops fixissimus Walker, 1856, Proc. Linn. Soc. London, **1**: 112.

Kröber (1924) credits this to "Philippinen" without locality. It is distinguished from the above by more yellowish face and a single cross band on tergite 2 only.

Genus **Cydistomyia** Taylor

Cydistomyia Taylor, 1919, Proc. Linn. Soc. N. S. W., **44**: 47.

Genotype *Cydistomyia doddi* Taylor, by original monotypy (= *Tabanus albithorax* Ricardo), New Guinea.

We have only recently recognized the importance of the hirsute subepaulets (basicostas) at the base of the wings in distinguishing the more specialized Tabaninae. Oldroyd (1949) reviewed the New Guinea fauna and very appropriately pointed out that "the miscellaneous residue [of species of Tabaninae] in this fauna has bare subepaulets" so that *Cydistomyia* rather than *Tabanus* is the appropriate genus for elements that cannot accurately be otherwise placed. This is probably the case in a considerable proportion of the South Pacific–Malaysian regions, though, as Oldroyd points out, the generic limits may remain ill-defined, pending the reappraisal of adequate material that is already under way by Mackerras (1954).

It is not surprising to find the genus represented in the Philippines.

KEY TO PHILIPPINE SPECIES OF *CYDISTOMYIA*

1. Face, cheeks, and beard white to very pale, straw yellow 2
   Face, cheeks, and beard distinctly yellow, to deep yellow 5
2. Predominantly blackish species with gray-banded abdomen; legs dark; antennae and palpi black with black hairs; plate a little longer than annuli (Negros Oriental) ..... *pechumani*, n. sp.
   Gray-brown species; appendages yellowish red 3
3. Basal callosity full width of front and with dorsal extension; annuli longer than antennal plate; hind-tibial fringe brown-haired; long spur-vein present (Busanga Is.) ..... *longirostris* (Sch. Stek.)
   Callosity isolated without extension; plate at least as long as annuli; hind tibiae predominantly yellow-haired; spur-vein absent or short 4
4. Front (♀) with tall, inverted V-shaped, median callus; plate half longer than wide, and longer than annuli; base of cell M_1 usually narrowed or even pointed but cell M_3 normal (Mindoro Is.) ..... *frontalis*, n. sp.
   Front (♀) entirely pollinose in the middle; plate narrower, twice longer than wide, and equal to annuli in length; base of cell M_3 pointed, but cell M_1 normal, truncated across base (Mindoro Is.) ..... *abava*, n. sp.
5. Face with conspicuous, denuded brown areas (at least ♀ with brown abdomen, yellow incisures expanded into tall, median triangles; ♂ unknown) (Negros Is.) ..... *parasol*, n. sp.
   Face entirely yellow pollinose (♀ unknown) 6

6. Wings clear; occipital margin of eyes (♂) with wide band of fine facets and row of tall erect hairs behind (Mindanao Is.).....*absol*, n. sp.
Wings with distinct apical shadow; eyes (♂) but little differentiated and without above features on occipital margin (Panay Is.).....*insol*, n. sp.

Cydistomyia absol, new species. Figure 99.

A predominantly yellow species having considerable likeness to *C. sol* (Sch. Stek.) of New Guinea but with black hairs on tergites

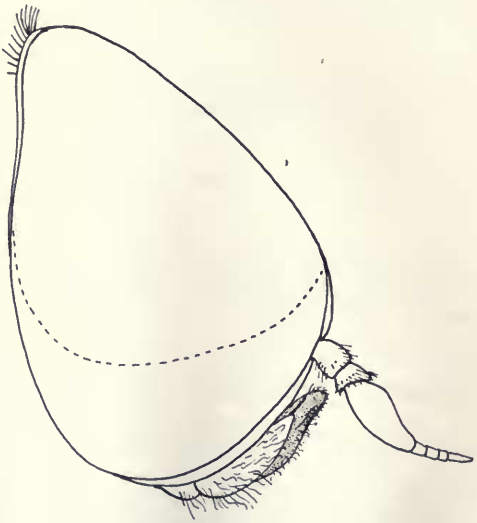

FIG. 99. *Cydistomyia absol*, new sp.; profile of head of male.

and tibiae, the legs darker distally and a fringe of erect black and pale hairs across the occipital margin of the eyes.

In addition to other differences, the males of related *C. insurgens* (Walker), *C. ochrothorax* (Sch. Stek.) and *C. breviusculus* (Walker) from New Guinea do not have the band of small facets along the hind margin of the eyes, nor is the fringe of occipital hairs mentioned.

Description (holotype, male).—Length, 12 mm., wings 11 mm. Head large, wider than thorax. Eyes bare, the enlarged facets dark brown, sharply demarcated in a little over the upper two thirds, the lower margin evenly curved and not produced downward or sinuous as in *T. wenzeli*, n. sp., but with a band of small facets continuing behind to the vertex. Tubercle almost invisible, deep in the occipital notch. Frontal triangle, face, and cheeks golden yellow with almost orange vestiture below. Antennae orange red with brown annuli as long as the plate; scape hardly produced above, with yellow and some brown hairs; plate a little longer than wide, not excised dorsally, the hump obtuse and low. Palpi orange, yellow haired with a few scattered black hairs on the second segment, which is swollen in

the middle to over half its comparative length and tapered to a blunt point apically. Shaft of proboscis ashy yellow with longer blackish labella.

Thorax and scutellum heavily yellow tomentose with an olive tint above due to obscured blackish integument revealed by scratches through the pollen of both. Entire thorax, coxae, femora, and venter of abdomen bright yellow to golden haired. Femora reddish, darkening on the knees of the fore pair. Fore tibiae and tarsi black, merging to deep reddish basally, black haired. Middle and hind tibiae, darkening apically, the tarsi brownish black, predominantly black haired, but yellow hairs basally on the under sides of the tibiae. Wings glass clear with yellow veins and stigma, the costal cell faintly tinted, cell R_5 wide open, no spur-veins, but slight thickening at the "elbow" of R_4 suggests there might be short ones in other specimens. Subepaulets orange, entirely bare. Halteres orange.

Abdomen yellow, the last three segments dull, ashy. Dorsum with unusually long black hairs, an occasional yellow one interspersed without accentuation on the incisures. Black hairs ventrally only on the last sternite.

Holotype.—East slope of Mount McKinley, Davao Province, Mindanao. Altitude 3,300 feet. Collected September 25, 1946, by H. Hoogstraal. In Chicago Natural History Museum.

Unfortunately, no other Mindanao specimens were discovered to confirm the distinctness of this species from variations of *Cydistomyia sol* in New Guinea.

Cydistomyia longirostris (Schuurmans Stekhoven), new comb.

Tabanus longirostris Schuurmans Stekhoven, 1926, Treubia, 6 (Suppl.), p. 421 (key), p. 422 (fig., pl.).

The type and a specimen below agree with the paratype female seen in NAM from Nias Island below Sumatra. It is strange that no specimens have been found in areas between Sumatra and the source of the present material from the north end of Palawan Island. However, it is possible that peculiar habits render these flies less liable to capture, since the present specimens were "attracted to live crocodile." There is remarkable superficial resemblance to *T. crocodilinus* Austen of tropical Africa, though that species has a few hairs on the subepaulets, an obscure abdominal pattern, shorter antennae, and frontal callosities without dorsal extensions. These specimens have entirely bare subepaulets to account for the generic reassignment. The proboscides are perhaps shorter than usual so that the name is not understandable; possibly the describer had in mind the unusually long antennae with the annuli almost a third longer than the plates. The eyes are green, unbanded. The over-all gray appearance is usually darkened by greasing, but such specimens are readily cleaned in ethyl acetate. Frontal indexes 1:3.5 to 3.9.

Material examined.—Five females, near sea level, Dimaniang, Busuanga Island.; collected March, 1947, by H. Hoogstraal. In Chicago Natural History Museum.

Cydistomyia insol, new species. Figure 100.

This is another of the small, yellowish species related to *C. sol* of New Guinea but with distinctly more slender antennae, wings with distinct apical shadows, and, in well-preserved specimens, median longitudinal yellow stripes which become obscured by wear. *T. insurgens* Walker appears to be closest, with yellow-brown beard,

FIG. 100. Antenna and palp of male: A, *Cydistomyia insol*, new sp.; B, *C. insol*, var. (?), Samar.

upper eye facets of male little differentiated, and wings with apical shadows, but the antennal plates are not as slender and but little longer than the annuli, the legs and thorax are entirely yellow, and the abdomen is yellow haired. The male of *Chasmiella breviuscula* (Walker) differs in several important respects including eye facets enlarged in upper two thirds, palpi not as slender, wings clear and hind legs entirely yellow. Both *Chas. ochrothorax* (Sch. Stek.) and *Cyd. lorentzi* (Ricardo) have yellow-brown beards, but the antennae are not as slender and the wings are clear. *Cyd. auriventer* Schuurmans Stekhoven (new comb.) has similar appearance and the same shape of palpi, but it differs in whitish beard, clear wings, and paler hind legs.

Cyd. celebensis Sch. Stek. (new comb., originally *Silvius*) is also close. A female from North Celebes, kindly lent by Dr. Mackerras, is smaller (8 mm.), has a tan thorax, yellowish scutellum, gray bloom only on extreme anterior margin, and darker abdomen with narrow, yellow incisures.

Description (holotype, male).—Length 10 mm. Eyes bare, the upper facets slightly enlarged in upper half without line of demarcation, the occipital fringe of

brown hairs short, the tubercle in occipital notch, small, ovoid, and depressed below the eye level. Frontal triangle and lateral cheeks buff yellow pollinose, buff gray on the face and inner cheeks; hairs and beard yellow brown. Antennae unusually long and slender, bright red to end of plate, the annuli brown and markedly shorter than the plate; scape and pedicel not produced dorsally, sparsely brown haired; plate thinner than pedicel and but little tapered distally. Palpi yellow with brown and yellow hairs intermixed, nearly twice longer than thick and tapering to a blunt point. Theca reddish, labella small and brown.

Thorax and scutellum dark brown with reddish margins, covered with dense olive green, buff-tinted pollinosity. Pleura buff pollinose, creamy pilose. Legs brownish red, the tibiae more reddish basally, femora and coxae yellow haired, the tibiae and tarsi mostly brown haired. Wings yellow tinted, with darker costal cells and apical shadows; a short spur-vein on one wing, cell R_5 wide open; subepaulets yellow, bare, tegulae with strong yellow hairs. Halteres reddish.

Abdomen elongate, gradually tapered, reddish to brown caudally on the sides with brown hairs, and a wide, worn, median, orange stripe with remnants of yellow hairs. Venter orange with yellow hairs, the last three sternites brown with concolorous hairs and yellow-haired incisures.

Holotype.—A male, collected on Panay Island, 1927, by Baker. In United States National Museum.

Paratypes.—Two males, same data; one in close agreement (in collection CBP); the other, smaller (8.5 mm.), the flagellums missing, the middorsal, yellow-haired line on abdomen sharper, less worn.

Remarks.—The series is insufficient to decide if two additional males from Samar (1927, Baker; USNM and collection CBP) represent variation or a distinct species. The casual appearance is the same, but the upper eye facets are not at all differentiated in size, the antennal plates are shorter, tapered, and subequal to the annuli, the apical palpal segments are shorter and rounded apically, and the lateral margins of the notums more widely yellow, the scutellums entirely so. Females from the two areas should decide this question.

Cydistomyia parasol, new species. Figure 101.

This was at first thought to be the female of *C. insol*, new sp. However, this differs in two important respects: the face has three prominent bare areas, and the abdomen is darker, with prominent yellow incisures that widen on the dorsum into a median row of tall triangles which nearly or just reach the anterior margins of the tergites.

Description (holotype, female).—Length 10 mm. Eyes (relaxed) green with suggestions of a single narrow purple stripe. Front parallel-sided, index 1:3.6, yellow pollinose with sparse black hairs, a gray patch at vertex but no ocelli; basal callosity brown, reddish on disc, drop-shaped, narrowly separated from ocular margins and tapered into a narrow extension which reaches just over half way to the

vertex. Subcallus, face, and cheeks yellow pollinose, beard pale yellow with some black hairs above; triangular, bare brown areas about the parafacial pits, and a shield-shaped, bare, brown area under the antennae almost divided by a narrow, median, pollinose line. Antennae slender, red, the annuli dark brown and shorter than plate; two basal segments not dorsally produced, with short, black hairs, the scape scarcely longer than tall; dorso-basal tooth on plate slight. Palpi brownish yellow, slender, with pale hairs on the basal segment, black on the apical segment. Labella brown, not reduced in size, theca yellowish underneath.

Thorax yellowish, the notum and scutellum with dark integument overlain by plumbeus bloom and sparse yellow and black hairs; pleura paler with straw yellow hairs. Legs brown, reddish at knees; coxae with yellow hairs, yellow and black

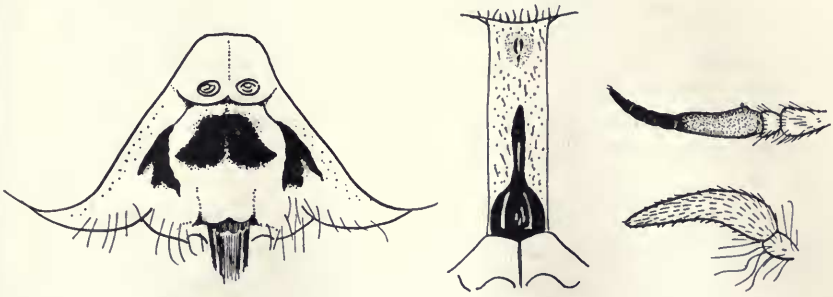

FIG. 101. *Cydistomyia parasol*, new sp.; front, face, antenna, and palp of female.

intermixed on femora, mostly black on tibiae and tarsi; no hind-tibial fringe. Wings as in *C. insol* with apical shadows, the costal cell and veins yellow, no spur-veins but with knots at the angles. Subepaulets bare. Halteres brown.

Abdomen brown with black hairs above, yellow-haired below; the incisures, sides of tergites, and narrow, median triangles on tergites 2 to 5, yellow and mostly yellow haired. Venter predominantly reddish on two basal sternites, darker caudad.

Holotype.—A female, collected on Negros Orientale, Mount Canlaon, 3,600 feet altitude, May 7, 1953, by H. M. and D. Townes. In collection of L. L. Pechuman.

Paratypes.—Females. Length, 9–12 mm. Thirteen, same locality and collectors as holotype, April 29 to May 8, 3,600 to 4,200 feet (in collection of CBP); one, Dumaguete, Negros Orientale, collected by C. T. Brues (in MCZ). The bare areas on the face are variably reduced but present in all, and the base of cell M_1 is variably narrowed, usually about half that of cell M_2. In worn specimens, the triangles are obscured to suggest a middorsal yellow stripe.

Cydistomyia frontalis, new species. Figure 102.

A small, reddish gray species with isolated callosity, raised, V-shaped median callus, reddish-yellow appendages, lightly tinted wings, veins

margining the base of cell M_1 narrowed to a fork at the apex of the discal cell.

Description (holotype, female).—Length, 7 mm. Front slightly widened above (index 1:4.9), yellow pollinose, a prominent, black, inverted V-shaped median callus, and a small, rounded, dark brown basal callosity without median extension. A narrow, gray, postocular rim margined behind by a row of short, upright, white hairs. Subcallus orange. Face, cheeks, and beard pale, straw yellow to dirty white. Antennae orange, two basal segments, sparsely black haired, plate with low basal angle and a little longer than the annuli. Palpi pale yellow, moderately swollen, and attenuated apically, apical segment with sparse black and a few pale hairs.

Notum and scutellum blackish covered with gray bloom, the antealar tubercles pale reddish, mostly denuded. Pleura and coxae gray with concolorous hairs. Legs red, femora pale haired, tibiae mostly black haired. Wings lightly tinted but no apical shadow, costal cells and veins pale yellow, cell R_5 wide open, no spur-veins. Halteres reddish yellow.

Abdomen denuded, dull blackish brown, the sides of tergites 2 and 3, and the incisures narrowly reddish; no pattern visible. Venter dull, dark gray, entirely pale haired.

Holotype.—A female, collected at San José, Mindoro Island, June, 1945, by W. L. Howe. In Museum of Comparative Zoology.

Remarks.—It is unfortunate that the body is so worn as to obscure any possible pattern that might have been present originally. Though there is a row of short upright hairs on the postocular rim, this could hardly be the female of *C. absol* above because the beard is not snow white and the wings do not have an apical shadow. The frontal characters are so distinctive that description of this poor specimen appears warranted.

Cydistomyia abava, new species. Figure 103.

A rather small, gray-brown species with reddish-sided abdomen, isolated basal callosity, reddish yellow appendages, lightly tinted wings, veins margining the base of cell M_3 narrowed to a fork at the apex of second basal cell, which, together with the absence of a median callus, distinguishes this from the preceding species.

T. humillimus Walker of Java and Celebes has some resemblance, but it has a narrower front and broader antennal plates.

Description (holotype, female).—Length, 10.5 mm. Front slightly widened above, index 1:4.7, discolored but probably buff gray pollinose, basal callosity, brown, rounded and isolated with no median extension, but with two convergent furrows above; postocular rim narrow, margined by a row of short, upright gray hairs. Subcallus and antennae orange, scape and pedicel with sparse white and a few lateral black hairs; plate twice longer than basal height, gently excavated but no distinct dorsal tooth, the annuli about as long as the plate. Palpi flesh-pink,

the apical segment with sparse black and some pale hairs, a little swollen basally, blunt apically.

Dorsum of body denuded and somewhat discolored, leaving the pattern uncertain. Notum and scutellum blackish with brown shadows, especially laterally; remnants of a gray, overlying bloom, and short yellow hairs. Pleura gray with whitish hairs. Legs, including coxae, pale reddish with mostly pale yellow hairs. Wings with yellow costal cells and veins, no apical shadows. The veins of the radial and medial sectors with several, peculiar, asymmetric, aberrant spurs which throw some doubt on normal presence of short spur-veins at base of vein R_4, but suggest

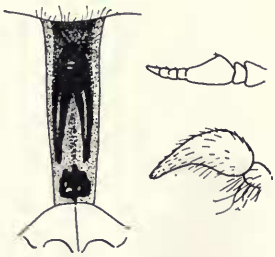

FIG. 102. *Cydistomyia frontalis*, new sp.; front, antenna, and palp of female.

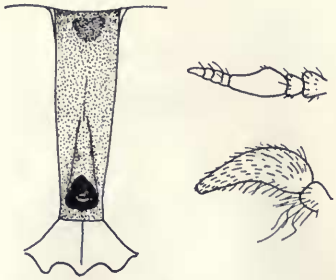

FIG. 103. *Cydistomyia abava*, new sp.; front, antenna, and palp of female.

certain explanations of atavistic reduction of veins in these sectors and reinforce the idea that this may be a primitive group of tabanine flies (hence the derivation of the specific name). Whether other specimens will show the same peculiar, X-shaped venation at apex of the second basal cell and base of cell M_3 by reduction of the medio-cubital cross-vein is open to question. Halteres yellow brown.

Abdomen reddish, probably predominantly yellow haired, with large, indefinite dark brown, median integumental spots on the first 5 tergites, darker caudally above and below.

Holotype.—A female, collected at San José, Mindoro Island, June, 1945, by W. L. Howe. In Museum of Comparative Zoology.

Remarks.—The relationship of this form was recognized by Dr. I. M. Mackerras, who forwarded the holotype for study.

Cydistomyia pechumani, new species. Figure 104.

This is a medium-sized, blackish-brown species with unusual, distinctive characters which include pale-banded abdomen, pale-margined thorax, heavy callosity, bare subcallus, hyaline wings with dark costal margin, and black appendages.

Though the antennal scapes are cylindrical and elongated more than in some American *Diachlorus*, e.g., *ferrugatus* (Fabr.), the wing and other characters exclude assignment to that genus, and the lack of a protuberant subcallus excludes it from *Udencocera*.

While this report was in press, Dr. Mackerras studied the type—on loan from the Berlin Museum—of *Lissimas fenestratus* Enderlein, from North Celebes. He found it to be congeneric, in a restricted sense, with *C. pechumani*, the type of which he has on loan from Dr. Pechuman. However, he is uncertain whether or not *Lissimas* and the related genus *Neotabanus* Ricardo (from Ceylon) can be maintained as more than subgenera. Common origin is indicated by their

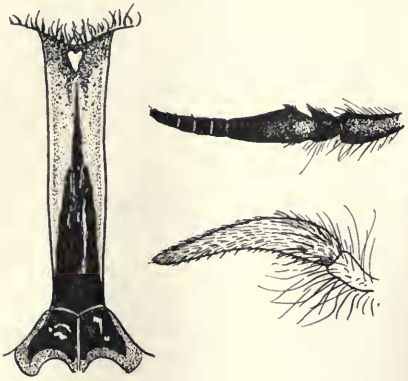

FIG. 104. *Cydistomyia pechumani*, new sp.; front, antenna, and palp of female.

peculiar fronts, swollen and shining subcalli (least pronounced in *C. pechumani*) and elongate antennae. The lack of a frontal callosity in *Neotabanus* and the possession of banded wings by *Lissimas fenestratus* quickly separate these from *C. pechumani*.

Description (holotype, female).—Eyes (relaxed) black, unbanded. Front slightly widened above, rather narrow, index 1:5.5, vertex depressed, irregularly shining black with black hairs, no ocelli, inconspicuous, short, pale hairs below; the heavy black callosity touching eye margins at lower corners and gradually tapering to a fine point which nearly reaches the vertex. Subcallus small, not protuberant, predominantly shining dark brown with narrow, brown pollinose, outer and lower margins. Face and cheeks whitish pollinose and pilose. Antennae slender, blackish, with black hairs, the plates dark brown with very low dorso-basal angle and but little longer than annuli, scapes just twice longer than tall and not produced dorsally. Palpi slender, blunt apically, dark brown with black hairs, whitish ones on the basal segment. Theca and labella black, the latter half the total length.

Thorax subshiny black with short black hairs on the notum, contrasting gray bloom on the margins which continues onto the scutellum. Pleura, chest, and coxae gray with whitish hairs. Legs blackish with concolorous hairs, some brown to yellowish ones on mid and hind femora. Wings subhyaline, the veins and costal cells dark brown, a very narrow costal margin of brown beyond the stigma; a short spur-vein on one wing, angulated only on the other. Subepaulets bare, blackish.

Abdomen blackish brown with black hairs, contrasting gray pollinose and pilose as follows: the sides of tergite 1, incisures of 2 and 4, a small median triangle on 3, and broadly on the incisures of sternites 2 to 4.

Holotype.—A female, from Negros Orientale, Mount Canlaon, altitude 4,700 feet, collected May 1, 1953. In collection of L. L. Pechuman.

Remarks.—This atttractive species is dedicated to my friend and well-known tabanid student, from whose collection the unique holotype was lent to me through the courtesy of Dr. I. M. Mackerras.

Genus **Tabanus** Linnaeus

Tabanus Linnaeus, 1758, Syst. Nat., ed. 10, 1: 601.

The bulk of the Philippine tabanid fauna belongs to this well-known genus, the generally robust members of which are distinguished by their hairy subepaulets and other characters given in the key.

KEY TO THE PHILIPPINE SPECIES OF *TABANUS*

Since many species appear to be new, the following key is provided for more rapid orientation. *T. fumifer* Walker and *T. factiosus* Walker were keyed from descriptions, as no material was available. *T. rubidus* Wiedemann and *T. triceps* Thunberg are also included, on the possibility that these common Oriental species will eventually be taken in the Philippines. Probably many more species will be added, since so many were represented in the present relatively small collections under study.

1. A rather small, subshiny black to dark brown species with red antennae, bare subcallus, and contrasting white tibiae ..... *ceylonicus* Schiner

   Not thus; if black, subcallus not shining 2

2. Wings with transverse dark or hyaline bands; large species, usually 20 mm. or more in length 3

   Wings clear or tinted, sometimes with clear areas in discal or other cells but not obviously banded; size variable 5

3. Body predominantly black; beard brown to black 4

   Body, including beard, predominantly reddish yellow; abdomen (♀) with broad contrasting yellow and dark brown to black bands. *vanderwulpi* Osten Sacken

4. Body and appendages entirely black or dark brown. [some ♀ *ixion*, couplet 6]

   Abdomen, including venter and scutellum, with pale spots or bands, antennae red ..... *bakeri*, new sp.

5. Large (usually over 17 mm.), predominantly black species with inornate abdomen, red antennae and wings strongly fumose or yellow 6

   Otherwise; if body predominantly dark, abdomen ornate or length not over 15 mm., antennae dark, and wings less strongly fumose 7

6. Antennae dark; scutellum black haired; wings and veins brown with centers of some cells paler; tibiae normal ..... *ixion* Osten Sacken

   Antennae reddish; scutellum with fringe of white hairs; wings and veins yellow, an indefinite, subapical, pale brown shadow, discal cell not paler than remainder of wing basally; tibiae somewhat thickened. *pseudixion*, new sp. (♂)

7. Medium-sized dark brown species with contrasting, whitish ornamentation on scutellum and tibiae....8

Mostly reddish gray to brown, seldom blackish species without contrasting pale scutellums....9

8. Wings clear, scutellum and abdominal incisures pale margined, front but little narrowed below (index 1:7)....*pallidiscutum*, new sp.

Wings fumose, intensified apically, scutellum entirely grayish white, abdomen with a row of pale-haired triangles, front strongly narrowed below (index 1:16.5)....*cnemidotus*, new sp.

9. A medium-sized (13 mm.) purplish-brown species; wings lightly tinted with brown-margined veins in apex, legs pale brown, antennae black, subcallus with a brown band across lower margin....*baguiensis*, new sp.

Not with this combination of characters....10

10. Medium-sized to small, *Cydistomyia*-like, yellow to pale reddish species without abdominal pattern (callosities often weak and yellowish; spur-veins usually present)....11

Abdomen reddish gray to brown, often with pattern; spur-veins seldom present....14

11. Abdomen, except at tip, entirely golden-yellow haired; fore legs and annuli darkened, the latter nearly as long as plates; front (♀) with brown, upward-produced callosity....*auripilosus*, new sp.

Abdomen with some to mostly black hairs and without the other combination of characters....12

12. Thorax yellow and yellow haired; beard usually yellow haired. *wenzeli*, new sp.

Thorax gray; pleura and beard white haired....13

13. Callosity (♀) pale red with long median extension; antennae slender. *anomalus*, new sp.

Callosity isolated, black, small without extension; antennae short and chunky. *brevicallus*, new sp.

14. Abdomen unusually tapered and slender caudally, without contrasting pattern; antennae red basally, flagellums black....15

Abdomen seldom tapered; pattern frequently distinct; antennae variable..16

15. Abdomen dark gray; the last two segments constricted like an ovipositor; wings clear, costal cell pale yellow....*attenuis*, new sp.

Abdomen evenly tapered, pinkish-red basally, dark caudally with pale incisures; wings clear, costal cells deep yellow....*conius*, new sp. (♂)

16. Medium-sized unicolorous gray species (blackish when greasy) with pale yellow to golden-haired bodies, black antennae, and brown margined veins in apex of wings....*confusiens*, new sp.

Not with this combination of characters....17

17. Abdomen with one or more pale longitudinal stripes....18

Abdominal pattern, when present, not striped....22

18. Body predominantly blackish with 2 prominent white stripes on notum, 2 laterally on first 2 abdominal tergites, and a median one starting abruptly on tergite 3; front (♀) wide, index 1:4 with protuberant, black callosity. *jucundus* Walker

Body reddish to brown, often with gray thorax and more than 2 dorsal stripes; abdomen differently patterned; front (♀) narrower, with smaller, usually brown callosity....18a

18a. Abdomen markedly attenuated caudad, the median stripe even, antennae red, style and femoral bases darkened, costal cell yellow ..... *effilatus* Stek.

Not with this combination of characters; costal cell clear, or when occasionally tinged (*reducens*), antennal plates darkened 19

19. Size usually under 15 mm.; median stripe sometimes narrowed, or even wanting on tergite 2; median callus spindle-shaped 20

Size usually over 15 mm.; median stripe composed of a series of narrow truncated triangles, or, when parallel-sided, lateral pale spots disconnected; median callus not usually expanded above the connection with the basal callosity 21

20. Fore legs bicolored; annuli dark; males and often females with median line interrupted at or narrowed on tergite 2; sides of basal callosity entirely contiguous to eye margins; proboscis black ..... *striatus* Fabricius

Legs and antennae essentially unicolorous; median line little narrowed on tergite 2; callosity narrowed above and separated from eyes below; proboscis with reddish theca, brown labella [Philippines?] ..... [*triceps* Thunberg]

21. Abdomen brown to black, the median, pale stripe broad and suddenly narrowed on tergite 6, the sublateral spots on tergites 2 and 3 only, ovoid and disconnected ..... *reducens* Walker

Abdomen lilac red with a gray overcast; median line consists of a series of narrow truncated triangles, the sublateral lines a series of jagged but connected spots to tergite 6 [Philippines?] ..... [*rubidus* Wiedemann]

22. Large (18 mm.) blackish species with lined thorax, median row of large equilateral triangles on abdomen, and pairs of large ovoid gray spots on sides of tergites 2 and 3 ..... *mindanensis*, new sp.

Otherwise; abdomen mostly reddish to brown without three rows of prominent gray spots on more than one tergite 23

23. Medium-sized (14 mm.); eyes unbanded; abdomen chestnut brown basally, a black median spot, three obscure gray spots and gray on the anterior margin on tergite 2 only; wings with apical shadows .... *samarensis*, new sp.

Without this combination of characters 24

24. Medium-sized, yellowish red species with single eye stripe, callosity very narrowly separated from eyes in wide front (1:5.5), dark thorax, and fore legs brownish, two hind pairs orange ..... *luzonensis*, new sp.

Not thus; fore legs seldom markedly darker than hind pairs 25

25. Body and legs chocolate brown with dark reddish tints basally on abdomen and indistinct, pale pollinose black-haired, flat triangles on some tergites; the flagellums mostly black, slender, the plates longer than the annuli. *pellus*, new sp. (♂)

Not with this combination of characters 26

26. Callosity touching eye margins at least at lower corners 27

Callosity viewed from above plainly separated from eye margins 31

27. Size under 15 mm.; legs red, flagellums black; fronts wider than 1:7.0 28

Size over 16 mm.; femora usually darker than tibiae and plates often reddish; fronts at least 1:10 29

28. Abdomen reddish with prominent yellow-haired incisure widened mesally; antennae and palpi slender, the scapes not swollen; eyes with one stripe. *provocans*, new sp.

Abdomen chestnut brown without pale incisures, a median row of low white-haired, equilateral triangles; eyes sea-green, unbanded in life .. *rossi*, new sp.

29. Abdomen predominantly rufous-orange haired, at least below, and without pattern ..... *palawanensis*, new sp.

Abdomen reddish brown with mostly black hairs above, whitish below, and low median triangles 30

30. Abdomen with distinct pale incisures, antennae black, and hind femora and tergal sides pale haired ..... *dissimilis* Ricardo

Abdomen with obscure, low triangles, but incisures, sides, and femora mostly black haired; antennae reddish ..... *hoogstraali*, new sp.

31. Abdomen uniformly orange red to reddish brown though there may be obscure, easily worn median patches of yellow hairs on the hind margins of some segments 32

Abdomen with definite pattern of spots or bands 34

32. Legs orange red with yellow hairs; flagellums black; eyes purple with single green band ..... *alticolus*, new sp.

Femora darker than tibiae; eyes unbanded 33

33. Antennal plates red; venter entirely orange haired.
[some *palawanensis*, new sp.]

Plates dark brown; venter with large black-haired median spots.
subjoidus, new sp.

34. Abdomen with pale, yellow-haired, small, equilateral triangles but at least incisures of tergite 2 and usually more, *not* distinctly pale; tergites 2 to 4 with black ovoid spots above the triangles; radial veins margined with brown; eyes with single purple band ..... *subimmanis*, new sp.

Not with this combination of characters 35

35. Legs almost uniformly dark red, predominantly black haired; a black ovoid spot above the pale triangle on tergite 2; eyes with single purple band.
unifasciens, new sp.

Not thus; femora, at least basally, darker than tibiae 36

36. Triangles equilateral and tall, almost crossing tergites 4 to 6; flagellums black; eyes unbanded ..... *neoindianus*, new sp.

Triangles flatter; flagellums and eyes variable 37

37. Beard white; small, discrete black spots above the triangles on tergites 2 and 3; eyes with a single purple band ..... *negritos*, new sp.

[*T. 5-triangularis* Sch. Stek. (eye colors unknown) possibly here; with yellow white beard, black spots on venter, size 21 mm.; Mindoro Is.]

Beard pale yellow to brown; sometimes shadows but not with discrete spots on tergites 2 and 3; eyes purple above, green on the lower half or unicolorous 38

38. Large species, 23 mm.; wings nearly clear, costal cell pale yellow, fore tibiae dirty white for nearly two thirds their lengths; eye facets (♂) nearly uniform; eye colors (♀) unknown ..... *factiosus* Walker

Usually smaller; wings brown tinted with yellow costal cells; fore tibiae darker reddish in basal half; males with upper facets enlarged; eyes (♀) in life purple above, green on lower half 39

39. Triangles resting on pale, yellow-haired incisures [Philippines?].
[*fumifer* Walker]

Yellow-haired fringes confined to median triangles, though incisures may be pale under black hairs ..... *immanis* Wiedemann

Tabanus ixion Osten Sacken

Tabanus ixion Osten Sacken, 1882, Berlin. Ent. Zeitschr., **26**: 99—Philippine Islands.

Ricardo (1911) suggested that her species, *T. inobservatus*, from Sumatra, might relate to *ixion*, but she was uncertain of the differences in sexes. The five males seen from Mindanao were at first considered to establish the synonymy because of variation in the wing pattern, particularly in the size of the hyaline spot in the discal cell and the degree of paleness in apical and anal areas, plus the inornate, blackish-brown bodies, dark, slender antennae and open cells R_5. In one specimen, the pale area is hardly noticeable in the discal cell. However, the two females seen later (one seen through the courtesy of Dr. I. M. Mackerras), which appear to be associated with the above males, have more extensive hyaline areas in the apex and across the cells below the stigma, and to a less extent across the second basal and anal cells; cells R_5 are closed and petiolate in both! These are quite different from the females described and figured as *T. inobservatus* by Stekhoven (1926), while the two described by Ricardo differ in having the median hyaline of wings confined to discal cells (as in males of *ixion*), scattered golden hairs on notum, reddish-brown callosity and conical abdomen.

Although there are no pale hairs on the bodies of these females, their wing patterns indicate recent common origin with the *flexilis-bakeri* complex, the species of which have variably ornate bodies and reddish antennae. Until future collecting provides enough specimens to prove that intergradation occurs, the species in this complex appear separable as keyed. It appears obvious that closure of cell R_5 here is not a reliable character, since the males, including Osten Sacken's and Ricardo's types, all have open cells, while the two Samar females seen by me have them closed and petiolate.

Description.—The lower area of small facets in the males is black, unbanded (relaxed), the footpads are brownish-yellow, the fore tarsal claws subequal, and the bright yellow halteres contrast to the dark-brown body. The tubercle in the occipital notch is very narrow and elongated.

Female allotype: Length 15.5 mm. Like the male, except for the usual sexual differences, with the following additional characters: the hyaline spot in the discal cell extends forward to include the bases of cells R_3 and R_5 below the stigma; cell R_5 is closed and petiolate, and there is a short spur-vein on each wing; the frontal index is 1:9.8, and the linear callosity is blackish; the antennal plates have brown shadows at the extreme base only, and otherwise are predominantly black; the palpi are slender, dark brown, and pointed; the tibiae (as in the males) are not swollen, as compared to *T. pseudixion* below.

Material examined.—Five males, Batuan, Mindanao, 1927, collected by C. F. Baker; allotype female, Samar, 1927, collected by C. F. Baker (USNM). Female, Antivao River, Samar, June 4–6, 1910, collected by J. J. Mounsey (in close agreement with allotype except larger, 20 mm., and the anal and second basal cells less fumose (BMNH).

Remarks.—It is interesting that all seven males had open cells R_5, but only two of five females are so characterized. There is an analogy here with the apparent sexual dimorphism of this character in *T. petiolatus* Hine of the United States; in that species these cells are closed in the females but are open in all known males (once differentiated as the since synonymized *T. yulenus* Philip). Because the more restricted hyaline spots in the wings of the males do not appear banded, *T. ixion* has been keyed in two places.

Tabanus pseudixion, new species. Figure 105.

A large, blackish-brown species with yellowish-orange wings with paler tips. It superficially resembles the *T. ixion* males but the veins are bright yellow, cell R_5 is closed, the discal cell is not paler in the center; there is a narrow margin of pale hairs behind the wing bases and around the apical half of the scutellum; all tibiae are heavier; the antennae are dark red and the footpads pale creamy.

Certain East Indies species, such as *T. crocinctipennis* Stek., have some of the features described below, but the combination of closed cell R_5, pale hirsute, scutellar margin, smaller eye facets, and red, narrow, antennal plates distinguishes the present species. *T. atrohirtus* Ricardo from Ceylon, with closed cell R_5, has yellow hairs on thorax and scutellum, and *T. nigrotectus* Bigot from Siam has brown wings with long spur-veins and lacks pale hairs on the scutellum. Thickened tibiae are not mentioned for either species.

Description (holotype, male).—Length, 21.5 mm. Eyes bare, black, unbanded (relaxed), the small facets in the lower half gradually merging into moderately larger facets in the upper half. Tubercle in occipital notch brown pollinose, ovoid, not as elongated as in *ixion*. Frontal triangle, face, and cheeks chocolate brown, beard black, pile dark brown on upper cheeks and face. Antennae dark brick red, black haired basally, plates very slender and elongate, the basal angle obtuse and not so prominent as in *ixion;* annuli broken. Palpi dark brown, a little shorter and more ovoid than in *ixion;* covered with black hairs.

Body dark, mahogany brown, covered with black pubescence, a small tuft of whitish hairs on tegulae, small, easily worn patches without pale triangles beneath in the middle of tergites 2 to 4, and laterally on the incisure of sternite 2, and obscurely on sternite 3. Legs black with black hairs; tibiae, especially the fore pair, distinctly thickened. Wings indistinctly paler yellow inward of the outer cross-veins, no spur-veins. Halteres with brown stems, yellowish knobs.

Holotype.—A male, Mount Galintan, Davao, Mindanao, collected in May, 1927, by F. Rivera. In United States National Museum.

FIG. 105. *Tabanus pseudixion*, new sp.; profile of head of male.

Tabanus vanderwulpi Osten Sacken

Tabanus vanderwulpi Osten Sacken, 1882, Berlin. Ent. Zeitschr., **26**: 97—Philippine Islands.

The describer believed he was offering a change of name for a Celebes species, *T. pictipennis* van der Wulp (preoccupied by Macquart) (=*T. flexilis* Walker). Fortunately he gave a full description of both sexes of his Philippine material. Stekhoven (1926) apparently followed this idea in listing *T. pictipennis* from the Philippines, but Mackerras (correspondence) questioned this presumed synonymy on the basis of his comparison of a male *T. flexilis* from Celebes (which he kindly forwarded) with my redescription of a Philippine male. In addition to the syntype male and female of *T. flexilis*, there are in the British Museum four males and two females in which cells R_5 vary from closed to narrowly open, again indicating this to be an unreliable character. Except for the marked difference in eye facets in respective males of the two species, the other differences are so minor that they could easily be attributed to individual variation among the few specimens available.

Males of *Tabanus flexilis* have the upper eye facets undifferentiated. Philippine males of *T. vanderwulpi* have the upper facets sharply enlarged and closed cells R_5, as described by Osten Sacken; one of the two studied also differs in having the dorsum of the abdomen entirely black haired with only a few obscure yellow hairs in the middle of tergal incisures 2 to 5, and at the outer corners of 3 and 4; the yellow-brown abdomen is but little darkened caudally. The last three segments in the other specimen and in *flexilis* are black with narrow yellow-haired incisures on segment 5. The Negros and Luzon males also have entirely black-haired legs, whereas the femora of *flexilis* are predominantly yellow haired.

A teneral Philippine female has the blackish and yellow-banded abdomen and closed cell R_5 as described for *T. flexilis* but is distinguished by having some black hairs on the palpi, beard and pleura orange yellow, not "yellow white" haired, and legs black haired except for a few yellow ones on the extreme bases of the two hind pairs of femora. Otherwise this specimen agrees with females of *T. flexilis* rather closely.

Material examined.—A female, Mati, Davao, Mindanao, collected June 6, 1927, by R. C. MacGregor; a male, Mabitac, Laguna, collected April 18, 1923, by R. C. MacGregor (USNM). A male, Dumaguete, Negros Orientale, no date, collected by C. T. Brues (MCZ). A male, Subic Bay, Luzon, collected in May, 1907, by J. C. Thompson (CAS).

Tabanus bakeri, new species. Figure 106.

This is a large blackish species with double banded wings and closed cells R_5, red antennae, black legs and body, narrow whitish incisures, and scutellum margined with white hairs.

Morphologically, it so closely resembles the preceding species, *T. vanderwulpi,* that it might be considered an extreme melanistic form. However, the three specimens described here are tinctorially so much darker than *T. vanderwulpi* that they are considered specifically different. The head characters and shapes of appendages are the same, but this species has black to brown beard and palpi, and the body vestiture is mostly black with white hairs as described, but without the orange color of body and vestiture which is so prominent in both sexes of the preceding species.

Description (holotype, female).—Length, 23 mm. Eyes bare, bluish green, unbanded (relaxed). Front very narrow, distinctly widened above, index 1:10, sepia brown pollinose, callosity reddish-brown and scarcely widened below, produced above nearly to the vertex as a long, narrow, blackish-brown median keel, vertex with a denuded, blackish V-shaped marking. Subcallus, face, and cheeks golden brown, dark brown haired. Antennal scapes red, unswollen, black haired; plates brick red, twice longer than basal width and than dark-brown annuli, the tooth prominent, rectangular. Palpi deep brown, black haired, long and tapering to a blunt apex. Proboscis dark brown.

Thorax deep chocolate brown with short black hairs, unlined, scutellum paler brown, contrasting tufts of snow-white hairs in front of, below, and above the wing bases, and more sparse around the margin of the scutellum. Coxae brown, legs blackish with black hairs, footpads bright whitish. Wing hyaline with brown costal margin and crossed by two contrasting brown bands, the first across the inner cross-veins and tapering out in the apex of the anal cell, the second broader beyond the stigma leaving the apex of the wing in cell R_4 hyaline; cell R_5 closed and

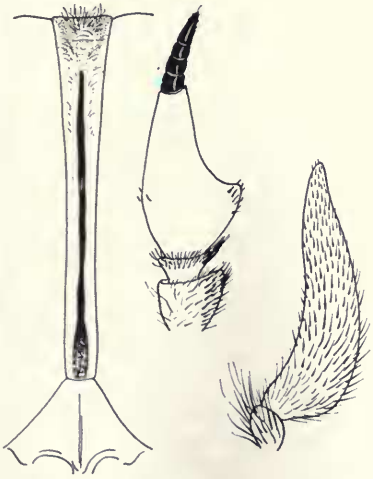

FIG. 106. *Tabanus bakeri*, new sp.; front, antenna, and palp of female.

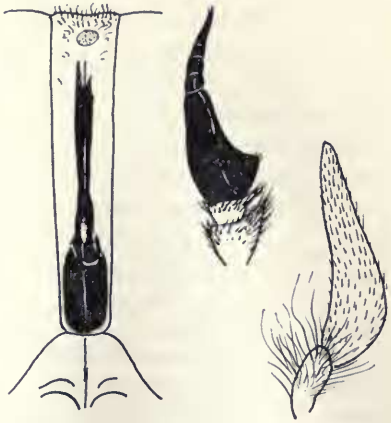

FIG. 107. *Tabanus baguiensis*, new sp.; front, antenna, and palp of female.

petiolate, no spur-veins. Subepaulets hairy. Halteres orange brown, paler on the seams.

Abdomen deep mahogany brown on the basal two segments, blackish thereafter, black haired with white hairs on the outer corners of the first three tergites and mesally as small median triangles on tergites 2 to 5, the incisures of 3 to 5 narrowly white pollinose, but black haired. Venter dark brown to blackish, the incisures of all but the last two sternites with contrasting, white pollinose bands, narrower than the yellow bands in *T. flexilis*.

Holotype.—A female, Samar, collected in 1927 by C. F. Baker. In United States National Museum.

Paratypes.—Two females, same data (one in collection of CBP). In general agreement, face and cheeks more golden yellow with yellow-brown beard, thorax olive green, scutellum pale green, some brassy hairs intermixed with black on notum, hair patches around wing bases and scutellar margin pale yellow, and white incisures above and below abdominal segments a little wider.

Remarks.—This attractive species is dedicated to the collector, who has contributed much entomological material from the Philip-

pine Islands. This species has a superficial resemblance to *T. marmorosus* Surcouf of Africa. The darker *T. speculum* Walker (Celebes) with more heavily infuscate wings obviously stems from the same ancestral stock.

Tabanus baguiensis, new species. Figure 107.

A medium-sized, blackish-brown species with purplish shades, black antennae, creamy white pile on under side of entire body including beard, and wing veins widely margined with brown.

Several species, including *T. caerulescens* Macquart, on the mainland or in the East Indies show some of these characters, but they are mostly much larger or have other combinations, such as black beards, reddish antennae and/or differently shaped fronts and callosities. There is no relationship to *T. vanderwulpi* Osten Sacken to which Surcouf had assigned these specimens.

Description (holotype, female).—Length, 15 mm. Eyes bare, one wide green band on purple ground (relaxed). Front slightly convergent below, index 1:7.0, buff gray pollinose, a small flat bare brown spot at vertex with suggestions of three vestigial ocelli in front of a patch of short black hairs, callosity mahogany brown, taller than broad, rounded below, almost touching ocular margins and gradually narrowed above into a heavy median callus which reaches to upper fourth of front, longitudinally furrowed at juncture with the callosity. Subcallus unusually small, pale yellow brown pollinose, a narrow, velvety black band across the top margining the callosity, and two half-moon rings of brown around the antennal fossae, which reach nearly half across the length of the subcallus. Face and cheeks whitish pilose and pollinose, the upper cheeks beside the antennae brown with some brownish hairs; the beard creamy white. Two basal segments of antennae brownish black with black hairs; plates black, a small reddish spot at extreme base, not quite twice longer than wide, distinctly excavated with a rectangular tooth, the annuli more reddish brown and a little shorter than plate. Palpi dull purplish-red, tapered to a blunt point nearly as long as the stylets and covered with black hairs, with some inconspicuous, pale yellow ones inwardly and basally. Proboscis black.

Notum dark reddish brown with a bluish-purple sheen, suggestions anteriorly of three indistinct gray lines, reddish shadows above the wing bases continuing around the hind margin of the scutellum; covered with inconspicuous coppery and black hairs. Pleura, chest, and coxae pale gray pollinose with creamy white pile. Fore legs dark brown with black hairs, a few pale ones on the femora, the tibiae dull reddish on the basal third. Two hind pairs of femora brown with bluish sheen in certain lights and with pale hairs, tibiae and tarsi reddish brown with mostly black hairs. Wings brownish, the costal cells and vein margins darkest, cell R_5 wide open. No spur-veins though there is a suggestion of a knot on one wing. Subepaulets hairy. Halteres reddish brown.

Abdomen subshiny, purplish brown at the base grading to deep brown-black caudad with bright bluish-purple iridescence in certain bright lights, incisures very narrowly paler red with a few inconspicuous pale hairs in the middle and along the extreme edges, the dorsal vestiture otherwise entirely deep brownish red. Venter

with same integumental color, widely gray pollinose along each side, the incisures and sides with more conspicuous, short, creamy hairs.

Holotype.—A female, Baguio, Benquet, Luzon, collected in 1927 by C. F. Baker. In United States National Museum.

Paratypes.—Two females, same data, but smaller, 13 mm., and partially greasy, mostly obscuring the iridescence and giving a more reddish-brown appearance. No spur-veins, front of one 1:6.7. In one, legs are practically unicolorous purplish-red. Otherwise in very close agreement (one in collection of CBP).

Tabanus mindanensis, new species. Figure 108.

Another large, grayish black species with lined thorax and trivittate abdomen, the median line consisting of a row of large, well-marked triangles, the sublateral markings accentuated on tergites 2 and 3, the antennae and femora black. The median row of large, non-truncated triangles and two pairs of sublateral spots on blackish abdomen appear to be distinct from those of any other Oriental species.

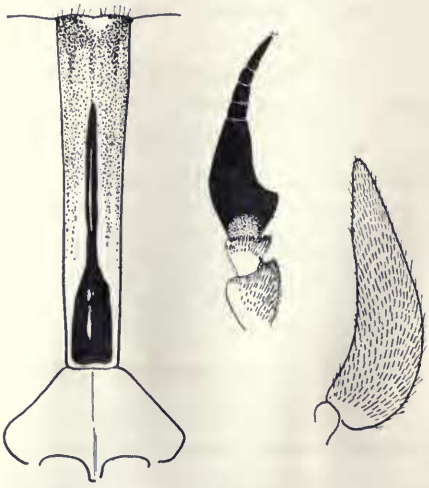

FIG. 108. *Tabanus mindanensis*, new sp.; front, antenna, and palp of female.

Description (holotype, female).—Length, 18.5 mm. Eyes bare, black, unbanded (relaxed). Front narrow (index 1:6.8), slightly divergent above, pale gray pollinose viewed from above, with evanescent dark, smoky greenish shadows seen from below; a small V-shaped black-haired marking at the vertex; basal callosity blackish, finely rugose, tall ovoid, about twice taller than wide, the lower corners rounded, narrowly separated from the ocular margins, and tapering into a thin median line reaching two thirds the distance to the vertex. Subcallus pale creamy pollinose with narrow smoky band across the top giving the callosity the false appearance of being separated from the lower margin of the front. Scape of antennae brown, but

appearing black because of dense hair coverage, pedicel dark reddish, third segment black, the plate long and narrow, distinctly excavated with a prominent rectangulate basal tooth, the annuli shorter than the plate. Palpi dirty yellowish, covered with short black hairs, thickened at the "knees" and tapering to a blunt point nearly to the tip of the proboscis.

Thorax and scutellum black, with four gray-haired lines, the submedian ones projected onto the outer corners of the scutellum; antealar tubercles dark smoky gray with black hairs. Pleura whitish pollinose and pilose with some brown hairs in the middle. Coxae similar, with no dark hairs. Femora dark, covered with gray pollen and with black hairs on the upper, and pale hairs on the lower surfaces. Tibiae dull reddish with mostly black hairs including the hind-tibial fringe, the fore pair darker on the distal halves. Wings distinctly pale brownish tinged, lighter behind, cell R_5 wide open, no spur-veins. Halteres brown, pale buff on the knobs. Subepaulets setulose.

Abdomen black on the dorsum with concolorous vestiture; tergite 1 with median patches of pale hairs in the middle and on the extreme forward corners, tergites 2 to 5 with prominent, median equilateral triangles, the apices just reaching the anterior margins, and the lower corners rounded inwardly just before the incisures. Tergites 2 and 3 with large, pale, ovoid, sublateral dashes not quite resting on the hind margins, and an indistinct brownish spot below them on tergite 4. Tergites 6 and 7 entirely black. Venter gray, pale haired on the sides and very narrowly margining the incisures, and with a median row of large black spots with concolorous hairs.

Holotype.—A female, Davao City, Mindanao, collected by H. Hoogstraal, May 10, 1946. In Chicago Natural History Museum.

Paratype.—A female, Mindanao, Abasca Plantation, 2,500 feet, collected by H. Hoogstraal, August 25, 1946 (in collection of CBP). In close agreement with the holotype but more worn. Lower corners of the frontal callosity less rounded, the shape, therefore, not so ovoid. There is more gray on the thorax and on the sides of tergites 1 and 2, and there is a very narrow median gray line crossing tergite 6.

Tabanus pallidiscutum, new species. Figure 109.

A medium-sized, blackish species with a white band around the scutellum, narrow, pale abdominal incisures, and the tibiae largely whitish.

Superficially, this species appears related to the Oriental *T. bicinctus* group, but this has a linear median frontal callus, and the pale band across the scutellum is narrower than in related species of that group. Stekhoven (1926) has redescribed more adequately the type and other specimens of *T. sexcinctus* Ricardo from Burma, and Shiraki (1918) records it from Formosa (Taiwan) while questioning the distinctness of *T. subcallosus* Ricardo from India. The fronts of both of these are much broader (not narrower than 1:4.5) and the median callus is broader and separated from the basal callosity.

Description (holotype, female).—Length, 13 mm. Eyes bare, with two green bands on purple ground (relaxed). Front narrow (index 1:7.3), slightly widened above, gray pollinose, with an evanescent smoky patch in the middle viewed from below, a pale brown spot across the vertex; basal callosity smooth, shiny black, rectangular, almost twice taller than broad and touching the eye margins its entire

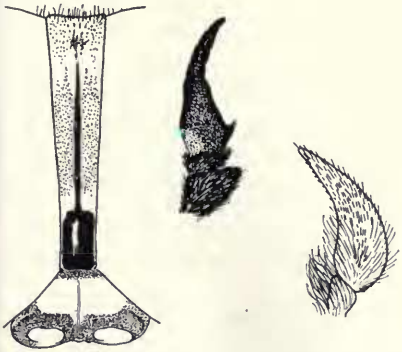

FIG. 109. *Tabanus pallidiscutum*, new sp.; front, antenna, and palp of female.

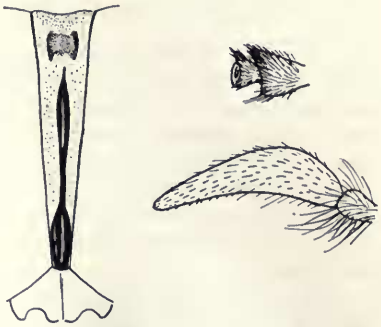

FIG. 110. *Tabanus cnemidotus*, new sp.; front, two basal segments of antenna, and palp of female.

length, barely connected to a fine median black line, three fourths the height of the front. Subcallus with a broad, shield-shaped pale gray band across the upper half, a chocolate brown band crossing above the antennae and continuing onto the upper corners of the genae. Remainder of cheeks and face whitish pollinose and pilose. Antennae entirely jet black, the scapes somewhat swollen and hood-like, taller than the plates, the latter with slightly sinuous excavation and rectangulate, dorso-basal tooth; annuli shorter than the plate but longer than its height. Palpi yellowish, with black hairs apically, becoming sparser among pale hairs basally, strongly swollen at the "knees," attenuated apically.

Thorax dull blackish on the notum, unlined, sparsely gray pollinose anteriorly and with scattered, fine black hairs; viewed from the side, an indefinite wide brown band between the wing bases; whitish pollinose and pilose marginal lines behind the wings continuing onto and widening over the entire scutellum, which has long brassy hairs. Coxae pale, pollinose and pilose; femora black with concolorous hairs above, pale ones along the lower surfaces; tibiae white with white hairs, blackish toward the tips, the fore pair black on the distal thirds. Wings glass clear, brown veined, cells R_5 wide open, very short spur-veins present. Halteres dark brown, subepaulets setulose.

Abdomen black dorsally, with narrow pale yellow incisures, widened a little in the middle of tergites 2 and 3 but hardly triangulate; black on the outer corners, which on tergite 2 include the entire, extreme edge. Venter black, the sides of the first four tergites gray with pale hairs and all incisures narrowly pale yellow.

Holotype.—A female, east slope of Mount McKinley, 3,300 feet, Davao Province, Mindanao, collected by H. Hoogstraal, September 24, 1946. In Chicago Natural History Museum.

Tabanus cnemidotus, new species. Figure 110.

A medium-sized, dark brownish-black species with bicolored legs (hence the name), pale gray scutellum, a row of pale-haired triangles, wings with apical shadows on vein marginings, and strongly convergent front below.

There appear to be no closely related Oriental species.

Description (holotype, female).—Length, 13 mm. Eyes bare, black, unbanded (relaxed). Front buff gray pollinose with an irregular dark bare spot at vertex, narrowed below to about one fourth the width at vertex, index 1:16.5, the callosity dark brown, touching the eye margins, about twice taller than wide and narrowed above into a long keel, expanded above, and reaching to the upper third of the front. Subcallus smoky brown with a darker band across the antennal fossae. Face and cheeks buff gray pollinose and sparsely whitish pilose. Scape and pedicel subshiny brown with black hairs (flagellums missing). Palpi dull brown, rather slender, black haired.

Notum denuded, blackish with some gray pollen anteriorly, lateral margins above wing bases pale gray with white hairs, continuing onto the entirely grayish-white scutellum; antealar tubercles gray above, blackish below, with black hairs. Pleura, chest, coxae, and sides of first tergites gray with white hairs. Legs black with mostly black hairs, the basal halves of fore tibiae and basal two-thirds of two hind pairs contrasting white with white hairs. Wings smoky, the costal border to apex more brownish. Cells R_5 wide open, no spur-veins. Subepaulets hairy. Halteres reddish brown.

Abdomen dark chocolate brown grading to blackish on the last three segments, the incisures very narrowly paler, but pale hairs only on outer corners, and in triangles half crossing tergites 2 to 4 which would disappear with wear. Remainder of abdomen above and below black haired with some brown ones intermixed.

Holotype.—"Mts. W. of Lapulapu, 2000–3000′." A female, Iwahig Penal Colony, Palawan Island, collected March 1–2, 1947, by F. G. Werner. In Chicago Natural History Museum.

Tabanus ceylonicus Schiner

Tabanus ceylonicus Schiner, 1868, Reise Novara Dipt., p. 93—Ceylon.
Tabanus nitidulus Bigot, 1892, Mem. Soc. Zool. France, 5: 679—Java.

This small blackish species with narrow front and bare subcallus represents a very distinctive element in the Oriental and Pacific Islands faunas. However, the inference in some literature that *Neotabanus* Ricardo was erected for this species is a mistake. Ricardo described an entirely different insect as *N. ceylonicus.*

In some specimens of the present species, the integumental color varies from black to reddish brown, and the vestiture may be entirely black or there may be marginal pale hairs around the thorax and tergal incisures. Stekhoven (1926) is of the opinion that the name *nitid-*

ulus should be applied to specimens with the latter coloring, as a variety. Though she considered *T. simplissimus* Walker as distinct, Ricardo (1911) questioned separation on tinctorial variation.

Material examined.—A male and a female, Mindanao, collected by C. F. Baker; 2 females, Isle Sibuyan, also collected by Baker; a female, San José, Mindoro, February, 1945, collected by E. S. Ross and F. E. Skinner (CAS); a female, Terragona, Leyte, June, 1945, collected by D. J. Pletsch (USNM); 2 females, Palo, Leyte, February 26 and June 2, 1957, collected by W. C. Frohne. These and four females from Cyclops Mountain near Hollandia, New Guinea, collected by L. E. Rozeboom, are the typical black form of the species.

Tabanus confusiens, new species. Figure 111.

A medium-sized species of patternless grayish to dark coloration depending on the condition of the specimen. Well-preserved females are heavily tomentose, with gray pollen, and are predominantly bright golden-yellow haired; antennae black; wings lightly tinted, with darker vein margins anteriorly.

Discolored or dark specimens might suggest *T. stauberi* Oldroyd of New Guinea, which has a narrower front and black hairs on the abdomen. There appear to be no relatives of *T. confusiens* in the East Indies.

Description (holotype, female).—Length, 12 mm. Eyes bare, green unbanded (relaxed). Front parallel-sided, index 1:5.6, olivaceous changing to yellow from dorsal view; callosity black, separated from eye margins, rounded below, tridentate above, the narrow median tooth expanding into a heavier black median keel which reaches to the upper fourth of the front. Subcallus, face, and cheeks yellow pollinose with pale yellow pile below. Antennae black, the scape with gray pollen and black hairs, the plate about a third longer than tall and a quarter longer than the annuli, the dorsal hump low, and with little excision. Palpi rather slender, covered with yellow pile basally and shaggy black hairs on the distal two thirds of the second segment.

Body and femora covered with a heavy buff or olivaceous gray pollinosity over a dark integument which is discernible only in worn or greasy spots. The notum and scutellum concolorous, with short, sparse, yellow, black and golden hairs intermixed. Antealar hairs brownish black, the pleura, chest, coxae, and femora with pale yellow pile. Distal halves of fore tibiae and all of tarsi blackish; the knees of the two hind pairs of femora broadly, and the tibiae, reddish with black hairs. Wings as long as the body, the costal cells and stigmas yellow, cells R_5 open, a very short spur-vein on one wing and a knot on the other. Subepaulets hairy. Halteres brown, paler on the knobs.

The only ornamentation on the abdomen consists of indistinct pairs of narrow, brown, transverse bands along the anterior margins of tergites 2 to 4. These would be overlooked if they had not been noticed in worn paratypes below.

Holotype.—A female, east slope of Mount McKinley, Davao Province, Mindanao, 3,000 feet, collected August 28, 1946, by H. Hoogstraal. In Chicago Natural History Museum.

Paratypes.—Six females, same locality but with various dates between August 21 and September 1, collected by H. Hoogstraal or F. G. Werner (three in collection of CBP). Five females, Mount Apo, Baroing and Galog Rivers, 6,000 to 6,500 feet, Mindanao, October 23 to November 9, C. F. Clagg (in MCZ and collection of CBP).

Remarks.—Without adequate material, wear and/or greasing would make identification difficult and suggest more than one species. The underlying dark integument is accentuated in one by a blackish rubbed thorax contrasting to the gray abdomen; in another specimen the whole body, including the front and face, appears blackish because of obscure greasing and discoloration. In two, the bloom is more gray than olivaceous and the body hairs are more yellow than golden. In two others, there is not even an angle at the fork, but most of the specimens have a knot in place of a spur-vein. The front is parallel-sided in most but in one is slightly widened at the vertex. The palpi vary from smoky to dull orange. In rubbed specimens with extended abdomens, the chocolate-brown, narrow, paired bands on tergites 2 to 4 are accentuated, but they are hidden by overlapping of preceding tergites when the segments are collapsed.

Tabanus wenzeli, new species. Figure 112.

This is a moderate-sized, yellow (in both sexes) species of the general facies observed in related species in the East Indies. Appendages yellow to orange, the wings mostly clear but yellow in the costal cells and outward of the stigmas, the body hairs yellow, but those on the dorsum of the abdomen black. Short spur-veins present and subepaulets hairy.

Cydistomyia sol (Sch. Stek.) has some superficial resemblance but the bare subepaulets, absence of spur-veins, basally yellow-haired abdomen, and more slender palpi readily distinguish *C. sol.* *T. flavipilosus* Sch. Stek. and *T. griseifacies* Sch. Stek. from Borneo and Assam have cheeks and beard whitish. *T. fuscifrons* Sch. Stek. from Borneo also has some resemblance, but the antennae and callosity are darker, the latter with a much heavier median extension, and the palpi darker and more gradually tapered. *T. flaviventris* Bigot from Assam has more slender antennae with yellow-haired scapes, broader fronts, and fulvous-haired abdomen.

Description (holotype, female).—Length, 12 mm. Eyes bare, uniformly green (relaxed). Front very narrow, index 1:8.5, slightly widened above, golden yellow pollinose, no bare spot at vertex, callosity small, ovoid, yellow, separated by half its own width from the eyes and prolonged half way to the vertex by a thin, hardly denuded, black line. Subcallus, face, and cheeks golden yellow pollinose and citron

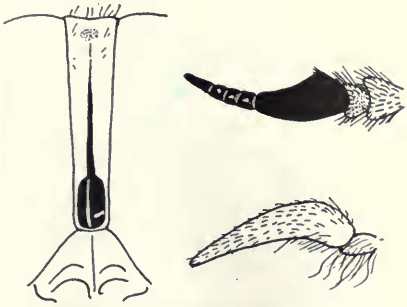

FIG. 111. *Tabanus confusiens*, new sp.; front, antenna, and palp of female.

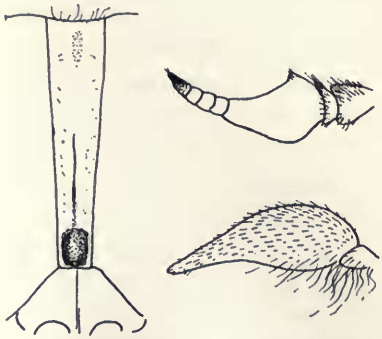

FIG. 112. *Tabanus wenzeli*, new sp.; front, antenna, and palp of female.

yellow pilose below with a few dark hairs intermixed, especially under the antennae and upper cheeks. Antennae orange red, the apical annulus brownish; scape not swollen, with black hairs above and yellow ones below; plate less than one third longer than tall, gently excavated dorsally, the hump obtuse; annuli equal to height of plate. Palpi deep yellow with concolorous hairs on the first segment, short sparse black ones on the second; the latter strongly swollen basally but attenuated into a long, slender point two thirds the length of the proboscis. Shaft of proboscis dull, pale brown, margin of labellum dark brown.

Thorax and scutellum yellow with olive tints suggesting that the underlying integument is black; vestiture predominantly yellow with a few short black hairs intermixed. Pleura, chest, coxae, and femora pale yellow pilose. Tibiae with yellow and black hairs, hind tibial fringe worn but with vestiges of black hairs. Fore tibiae on the distal third and fore tarsi dark brown; two hind pairs of tarsi yellow-red. Wing veins yellow, spurs shorter than stems in both wings; cell R_5 wide open. Tegulae with a few short black hairs anteriorly, longer yellow ones behind. Halteres with pale orange knobs.

Abdomen orange yellow, lighter than the thorax, with a few scattered yellow hairs not sufficiently concentrated on the incisures or outer corners to make these parts lighter in appearance. Venter predominantly yellow haired laterally, mostly black haired in a wide median band.

Allotype (male): Length, 11.5 mm. Closely resembles the female except in the usual sexual differences, and readily associated. Head very large, and wider than thorax. Eyes bare, the enlarged facets reddish and occupying nearly the upper three fourths, the lower margin sinuous, and a wide extension of small black facets along the occipital margin to the vertex, but no prominent, upstanding fringe of hairs behind. Tubercle in occipital notch yellow pollinose, elongated and at eye level. Face deeply sunken beneath antennae and giving the cheeks on either side

a swollen appearance. Antennae much more slender than in female, the scapes with fewer dark hairs dorsally. Second palpal segments ovoid, thickest at the outer third, not quite twice longer than thick, and with fewer black hairs than yellow. Proboscis pale red, fleshy, the labella half its length and with brown margins. Spur-veins likewise shorter than stems in both wings. Tegulae entirely yellow haired. Dorsum of abdomen almost entirely black haired except for a few yellow hairs on the outer margins. Venter predominantly yellow haired, black ones increasing on the last three sternites.

Holotype.—A female, Pikit, Catabato Province, Mindanao, 25 feet above sea level, at light, collected by F. G. Werner, December 15, 1946. In Chicago Natural History Museum.

Allotype.—A male, Dimaniang, Busuanga Island, Calamianes Group, near sea level, collected by H. Hoogstraal, March, 1947. Taken in vicinity where females of *Cydistomyia longirostris* were captured, but there is no resemblance to these. In Chicago Natural History Museum.

Paratypes.—Male, San José, Mindoro, collected in May, 1945, by E. S. Ross (CAS). In close agreement to allotype except that the abdomen is predominantly yellow haired and not darkened caudally. Female, Osmeña, Samar, April, 1945, J. Laffoon (USNM); a second, teneral male, same data, has dark haired abdomen. *Cydistomyia absol*, new sp., looks superficially like these males, but the plate in that species is broader and shorter, the annuli darker, the palpi more pointed, the lower margin of enlarged facets straight, the costal cell paler yellow and there is no evidence of spur-veins.

Remarks.—Named for Mr. R. L. Wenzel of Chicago Natural History Museum, who stimulated this report.

Tabanus brevicallus, new species. Figure 113.

A small, slender, *Cydistomyia*-like, yellowish species with yellow appendages, whitish beards, yellow-tinted wings without spur-veins, and patternless abdomen with black and some yellow hairs which may suggest a yellowish, median line in unworn specimens.

T. griseifacies Sch. Stek. from Ceylon and *T. humillimus* Walk. from Celebes are related, but differ in having clear wings, antennae with annuli that are nearly as long as the plates, and at least the femora not predominantly black haired. The latter species also has a strongly divergent front toward the vertex.

The holotype female of this species was determined by Surcouf as *T. flaviventris* Bigot and the allotype male as *T. negativus* Ricardo "var." From the former species, this female is distinguished by

wider front, probably wider antennal plate (the male antenna would not be considered slender), palpi less robust basally because under side is curved, not straight as redescribed by Ricardo (1911), legs chiefly dark haired, and wings without spur-veins. Since the male of *T. brevicallus* appears correctly assigned from duplicate locality records, the female of *T. negativus* without frontal callosity would not fit, and the lack of a sharply defined area of enlarged facets in the upper two thirds of the eye area does not agree in the male of the latter.

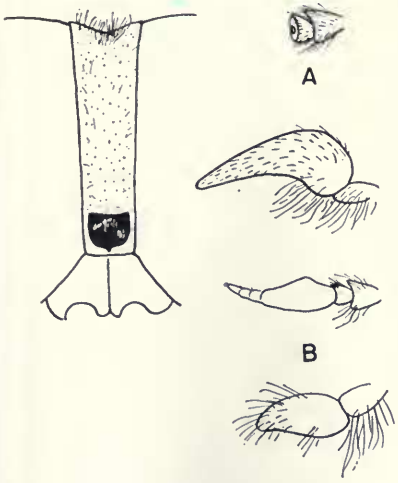

FIG. 113. *Tabanus brevicallus*, new sp.; A, front, two basal segments of antenna, and palp of female; B, antenna and palp of male.

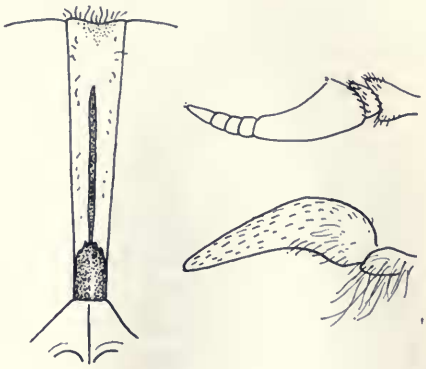

FIG. 114. *Tabanus anomalus*, new sp.; front, antenna, and palp of female.

Description (holotype, female).—Length, 12.5 mm. Eyes bare, green, unbanded (relaxed). Front parallel-sided, index 1:4.3, depressed at vertex, yellow pollinose with short black hairs; no median callus or line, the basal callosity small, subquadrate, dark brown, isolated both from eye margins and from the orange-yellow subcallus. Face and cheeks pale-gray pollinose and pilose with some buff tints next to the eyes. Two basal segments of antennae reddish, but little produced dorsally and with short black hairs (flagellums missing, but see description of male). Palpi pale yellow with mostly black hairs, swollen basally and tapered to a long point reaching nearly to tips of mouth stylets. Theca pale yellow, labella orange.

Thorax and scutellum dark brown with indefinite reddish margins and mostly appressed brassy hairs. Pleura, chest, and coxae gray brown with whitish pile. Remainder of legs uniformly red, predominantly black haired with many yellow hairs on the hind femora. Wings pale yellow tinted, the costal cells and stigmas a little darker, but no accentuated apical shadows. Cell R_5 wide open, no spur-veins. Subepaulets hairy apically, bare basally. Halteres orange.

Abdomen elongate and but little tapered, tergite 7 unusually protuberant and wide; reddish yellow without pattern except for yellow median and lateral hair patches, and some yellow hairs on the incisures, remainder black haired. Venter orange, entirely yellow haired, except for dark brown hairs on sternite 7.

Allotype (male): Length, 9.5 mm. In close agreement with the female except for the usual sexual differences. Head large, wider than thorax, eyes bare, enlarged facets reddish in little more than upper half, a narrow, occipital margin of black facets to the vertex, but no prominent upright hairs. Occipital notch with small, sunken, blackish tubercle. Frontal triangle orange pollinose. Flagellum red, with plate about twice longer than annuli, basal angle obtuse, and hardly excavated. Palpi predominantly white haired. Subovoid and blunt apically. Femora with more yellow hairs than in female and abdomen over-all more yellowish.

Holotype.—A female, Surigao, Mindanao, collected in 1927, by C. F. Baker. In United States National Museum.

Allotype.—A male, same data and location.

Paratypes.—Male and female, same data (in collection of CBP); female, Dapitan, Mindanao, collected in 1927, by C. F. Baker (USNM); female, "Nr. Lalabuan, Inifao, Mindanao, V/15/1946," collected by H. Hoogstraal (CNHM); 5 females, San José, Mindoro, collected in May and July, 1945, by E. S. Ross (CAS); female, Antiyao River, Samar, "4/5–6/6,10," collected by J. J. Mounsey (BMNH; seen through courtesy of I. M. Mackerras); 6 males, 3 females, one mile east of Tarragona, Leyte, no date, collected by C. L. Remington (in MCZ and collection of CBP). All in good agreement, but often poorly preserved. One antenna of the Inifao female is intact and the annuli are relatively longer compared to the plate than in the male.

Remarks.—There is undoubted convergence here with some *Cydistomyia* species. Mr. H. Oldroyd kindly compared paratype females with the type of *T. humillimus* Walker in the British Museum, and commented that they are "certainly not *humillimus* Walker, which is a small grayish-brown fly with blunt abdomen, quite unlike the rather elongate yellowish abdomen of your specimens. There is fairly good resemblance of frons, palpi, and antennae, though not an exact coincidence. I have nothing like your species in the collection here. . . . ."

Tabanus univentris Walker

Tabanus univentris Walker, 1848, List Dipt. Brit. Mus., 1: 151—Borneo.

Kröber (1924) attributes this to "Philippinen" without further locality (see p. 619).

Tabanus flaviventris Bigot

Tabanus Flaviventris Bigot, 1892, Mem. Soc. Zool. France, 5: 657—Indie orientale.

This, like the preceding, is assigned by Kröber (1924) to "Philippinen" without further locality, and both have plain, unpatterned abdomens (see pp. 619, 620).

Tabanus anomalus, new species. Figure 114.

A medium-sized, slender, reddish fly allied to *T. brevicallus,* with narrow front, small yellow callosity, red antennae and tibiae, and no spur-veins; *T. anomalus* has ashy-gray thorax.

Superficially resembles the paratype of *T. auripilosus,* new sp., but the callosity is yellow and more angular here, the palpi are less shaggy haired and more pointed, the pale hairs of the hind femora are not golden, and the entire vestiture of the abdomen is shorter, sparser, pale yellow and black rather than golden. There is no apical shadow of the wings evident here. *T. diversifrons* Ricardo from Assam appears to be closest but has bicolored legs with dark femora and there is a more evident spot on tergite 2. *T. nigrimedius* Sch. Stek. has black antennal plates and a narrow dark mid-abdominal line.

Description (holotype, female).—Length, 13 mm. Eyes bare, green, unbanded (relaxed). Front narrow, sides almost parallel, index 1:7.6, buff gray pollinose, callosity yellow, oblong, a little taller than wide, touching eye margins below and very narrowly separated above, abruptly narrowed to connect with a fine brown keel reaching to the upper third of the front. Subcallus pale reddish pollinose. Face and cheeks buff gray with pale yellow pile. Antennae red, the annuli sharply dark red; black haired basally, the plate half again longer than wide and a little longer than the annuli. Second segment of palpi yellow, sparsely black haired, somewhat thickened basally and tapering to a point. Proboscis black.

Thorax and scutellum dark ashy gray with suggestions of three fine gray lines anteriorly, antealar tubercles red, covered with appressed pale yellow hairs, and fine, more erect, black ones. Pleura, chest, and coxae dark gray with creamy pile. Femora dark brown, the two hind pairs broadly reddish at the knees, predominantly pale haired. Fore tibiae basally and two hind pairs reddish with mostly black hairs, a few pale ones basally underneath. Wings subhyaline, the costal cells yellow, no evidence of apical shadows. No spur-veins, though there is an angulation in one wing. Cell R_5 wide open. Subepaulets hairy, halteres yellow.

Abdomen brick reddish, dorsally worn, thus removing any median pattern in the vestiture, the last three segments above and below brown with prominent yellowish incisures; tergite 1 with two patches of pale hairs under the scutellum, pale yellow hairs mesally and some dark hairs laterally. Tergite 2 with a brown ovoid shadow mesally, the hairs that remain laterally, short, mixed yellow and black; scanty remains of vestiture on succeeding tergites is apparently the same, with

black hairs increasing caudally. Venter similar in color, entirely short, pale-yellow haired, black hairs on the last two sternites.

Holotype.—A female, Philippine Islands, collected in 1920, by E. H. Haxeford. In United States National Museum.

Tabanus auripilosus, new species. Figure 115.

A medium-sized, golden-yellow species with plain orange-yellow abdomen covered with golden-yellow hair above and below, narrow front, predominantly reddish appendages, and short spur-veins.

There is considerable resemblance to the much larger *T. flavissimus* Ricardo of Ceylon, which has more slender antennae.

Description (holotype, female).—Length, 13.5 mm. Eyes bare, apparently uniformly green (relaxed). Front with parallel sides, index 1:7.0, golden-yellow pollinose and short pilose, a sooty, black-haired triangle at the vertex, callosity dark brown, drop-shaped, nearly twice taller than wide, rounded below, narrowly separated from ocular margins, tapered rather rapidly into a thin, median, concolorous line which reaches about the upper fourth of the front. Subcallus, face, and cheeks golden-yellow pollinose, and pilose below, sparse brown hairs on the upper cheeks. Antennae red, the annuli sharply black, with black hairs basally; plate rather slender, about twice longer than wide, distinctly excavated dorsally, the tooth subrectangulate, annuli long, a little shorter than the plate. Palpi orange, rather slender, blunt apically and predominantly shaggy, black haired. Proboscis black.

Thorax and scutellum concolorous, heavily golden pollinose and pilose, overlying blackish integument which shows only in worn spots. Pleura, chest, and coxae the same. Fore legs deep brownish, black haired except for a few yellow ones on the reddish basal third of the tibiae. Mid and hind pairs uniformly reddish with golden hairs, the tips of the tibiae and tarsi brown with black hairs. Wings tinted, the costal cells deep yellow and a distinct apical shadow below the costa, margining the branches of the radial vein, veins yellow; spur-vein on one wing half the length of the stem, a pronounced knot only on the other; cell R_5 wide open. Subepaulets hairy. Halteres orange.

Abdomen without pattern, the golden hairs rather long and shaggy; tergite 7 sharply blackish with black hair. Venter becoming dusky from sternite 4 caudad, the seventh blackish with black hairs as above. No integumental black spots on the second segment.

Holotype.—A female, Lucban, Tayabas (Quezon), collected in May, 1926, by R. C. MacGregor. In United States National Museum.

Paratype.—A female; length, 13 mm., same data (in collection of CBP). Agrees closely but frontal index 1:7.4, the callosity egg-shaped, more abruptly narrowed above, the vestiture of the cheeks, pleura, and coxae paler yellow, and with more black hairs on the upper cheeks and on nearly the apical halves of the hind tibiae. The sixth abdominal segment is blackish like the seventh.

Tabanus samarensis, new species. Figure 116.

A medium-sized, dark species with strong costal shadow to apex of wing, eyes (relaxed) greenish without stripes, femora darker than tibiae, beard creamy white, and second and third tergites reddish brown grading to blackish thereafter with red incisures and suggestions of a median row of low triangles. The second tergite has a blackish median spot and a peculiar pattern of grayish pollinosity distinct from any Oriental species I have seen described.

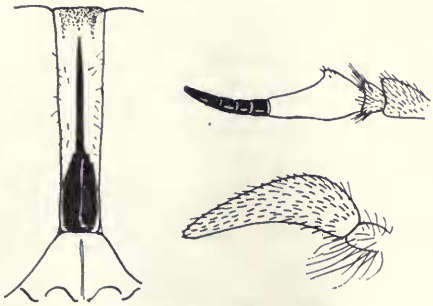

FIG. 115. *Tabanus auripilosus*, new sp.; front, antenna, and palp of female.

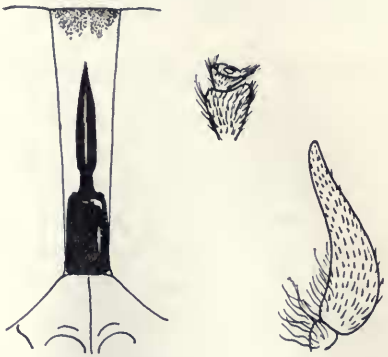

FIG. 116. *Tabanus samarensis*, new sp.; front, two basal segments of antenna, and palp of female.

Description (holotype, female).—Length, 14 mm. Eyes bare. Front slightly widened above, index 1:7.3, buff gray pollinose with a sooty band across the vertex, callosity mahogany brown, oblong and taller than broad, filling the lower part of the front, tridentate above, the median prong narrow but widening into a spindle-shaped, blackish brown median callus in the middle third of the front. Subcallus sooty brown with wide yellow collars above the antennal fossae. Face and cheeks buff gray with creamy white pile. First two segments brown, black haired, the third segments missing. Palpi pale yellow, the second segment long and rather slender, basally a little thickened, the apex pointed. Notum and scutellum blackish brown, thinly dusted with gray pollen and with inconspicuous brassy and short black hairs, unlined; reddish brown on margins around wing bases. Pleura, chest, and coxae ash gray with creamy pile. Femora blackish brown with mostly pale hairs. Tibiae dull reddish, the distal third of the fore pair, tips of hind pair, and tarsi blackish, mostly black haired. Wings subhyaline, narrowly brown along the costal margin to the apex of the wing. No spur-veins, cell R_5 open. Subepaulets hairy. Halteres brown, bright yellow on the seams.

Abdomen with first tergite black, a wide reddish incisure, black haired with median patches of yellow hairs; second tergite broadly reddish to chestnut brown, the median black spot bisected by a narrow triangle of buff-gray pollen, a pair of flat, inverted, gray pollinose triangles on the anterior margin on either side above

the median black spot, and below each triangle a pair of isolated, ovoid gray spots which are accentuated in certain lights, all of these gray spots overlain by black, not pale, hairs; third tergite entirely reddish brown with a darker, indefinite median shadow, but no gray pollinose spots; tergite 4 blackish brown, with reddish shadings on the sides; the remaining tergites black with red edges, except tergite 7, which is entirely black. All tergites but seventh with small, median tufts of yellow hairs over very low, yellow triangles which are the expansion of mostly black haired incisures. Lateral margins of abdomen yellow haired. Venter reddish with dark median shadows, mostly black haired with pale haired incisures, darker caudad.

Holotype.—A female, Osmeña, Samar, collected in April, 1945, by Jean Laffoon. In United States National Museum.

Tabanus luzonensis, new species. Figure 117.

A medium-sized, yellowish-red species with dark thorax, orange legs, the fore pair more brownish, wings yellow tinted, darker along the costal and vein margins, and eyes green with broad purple stripe.

T. rubriventris Macq. of New Guinea and *T. madorensis* Sch. Stek. of Java have some similarities but the fronts of both are narrower, the abdomen and hind legs are darker, and the former has edges of tergites extensively black haired.

Description (holotype, female).—Length, 16.5 mm. Eyes bare. Front parallel-sided, index 1:5.5, ash-gray pollinose with buff tints below and a patch of short black hairs in a notch at the vertex; callosity mahogany brown, large ovoid, nearly twice taller than wide, separated from eyes by very narrow pollinose margins viewed from above, median furrow in the upper half, connected narrowly to a moderately expanded, spindle-shaped median callus which again narrows just above the middle of the front into a long, very thin, bare line. Subcallus pearlaceous, golden-gray with a prominent though narrow, dark brown, velvety band across the apex beneath the callosity. Face and cheeks pale, creamy-gray pollinose and pilose, beard pale yellow, nearly white. First two antennal segments reddish brown with black hairs, third missing. Palpi pale yellow with sparse yellow and black hairs, tapered to a long, thin point. Proboscis black.

Notum and scutellum olive-gray pollinose with brown shadings on margins and sutures. Pleura, chest, and coxae buff pollinose with yellow pile. Fore femora, fore tibiae at apex and all tarsi brown, the first with yellow hairs. Basal two thirds of fore tibiae reddish with yellow and black hairs. Two hind pairs of legs bright orange with yellow hairs, a few black ones on the tibiae. Halteres orange. Cell R_5 open, no spur-veins. Subepaulets hairy.

Abdomen above and below reddish orange on basal four segments, the following ones dark brown with wide orange incisures. Dorsum mostly black haired, including incisures, except for golden-yellow patches of hairs along the margins and in the middle as obscure, sparse, tall triangles which would disappear completely with wear. Entire venter golden-yellow haired.

Holotype.—A female, Ube, Laguna, Luzon, collected in June, 1929, by R. C. MacGregor. In United States National Museum.

Paratype.—A female, same data (in collection of CBP). Length 14 mm. In close agreement except that the yellow-haired triangles are more worn, there is a more evident, faint brownish band across the bases of the antennae between the eyes, and the callosity is smoother, less tall, and appears to touch the eye margins below. Both specimens have suffered minor pest damage.

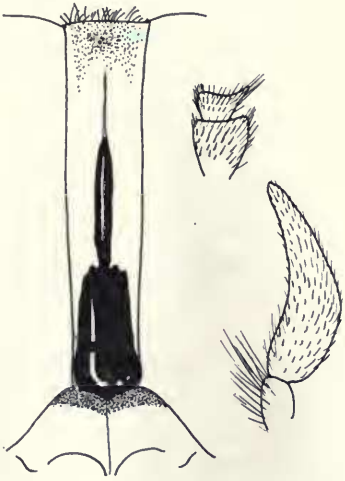

FIG. 117. *Tabanus luzonensis*, new sp.; front, two basal segments of antenna, and palp of female.

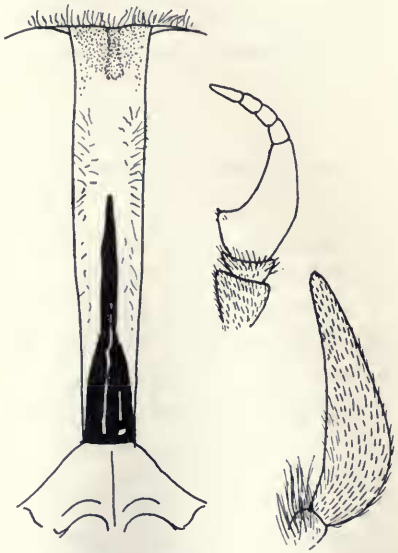

FIG. 118. *Tabanus palawanensis*, new sp.; front, antenna, and palp of female.

Tabanus palawanensis, new species. Figure 118.

A medium-sized species with very narrow front, ashy-gray thorax, contrasting rust-red abdomen and antennae, and bicolored legs, but the anterior tibiae are reddish basally, and the palpi pointed and pallid with black hairs. This species has some affinities with *T. pallidepectoratus* Bigot of Saigon, including similar narrow fronts and callosities, but the latter is larger and has black legs with the basal thirds of all tibiae white.

Description (holotype, female).—Length, 16 mm. Eyes bare, blue-green, unbanded (relaxed). Front narrow, index 1:10.2, convergent below, gray pollinose changing to buff viewed from above; callosity dark brown, touching the eyes only at lower corners, minutely tridentate on lower margin, about twice taller than broad, tapering gradually into a keel above, which is attenuated at a little over half the height of the front. Subcallus thinly buff pollinose. Face and cheeks whitish pollinose and pilose. Antennae red, the annuli sharply black; scape not

enlarged, black haired; plate a little over a third longer than tall, strongly excised with sharp, slightly acute dorsal tooth; annuli not as long as plate, but longer than its height. Palpi pale yellow, elongate nearly to end of stylets, moderately thickened basally and gradually tapered to a moderate point, black haired, with white pile on the basal segment. Proboscis black.

Thorax ashy-gray with suggestion of brown at the sutures, paler gray pollinose anteriorly and in two prescutellar, abbreviated spots but no distinct lines. Pleura pale gray with smoky hairs above, whitish pile below and on chest, coxae, and ventral aspects of the femora. The latter blackish with concolorous hair dorsally. Fore tibiae basally, and the two hind pairs, entirely reddish with mostly black hairs outwardly, reddish inwardly. Wings clear behind, yellow-tinted anteriorly with deep yellow costal cells and stigma; cell R_5 wide open, no spur-veins. Subepaulets hairy. Knobs of halteres orange-yellow.

Abdomen satiny rust-red with almost orange shadings accentuated by intense red hairs sublaterally on the tergites not accentuated on the incisures, black hairs obscurely predominating in the middle and on the sides. No pale triangles or median hair patches. Venter deep orange with dull, darker shadows on the basal sternites, sparse black hairs evident in the middle in certain lights.

Holotype.—A female, from Palawan, without specific locality, collected April 27, 1947, "In flight in cocoanut grove." In Chicago Natural History Museum.

Paratypes.—Two females labeled simply "Palawan" (CNHM and CBP); female, Iwahig, Palawan, collected in June, 1945, by Jean Laffoon (USNM). Length, 14 to 17.5 mm. The smaller of these differs in having a narrow, but shorter front, index 1:7.6, the dorsal vestiture of the abdomen almost entirely sparsely black haired, giving the abdomen a more dark, brick-red appearance, but likewise not appreciably darkened in color caudally. Otherwise the specimens are in close agreement. The USNM specimen has a faint suggestion of a pale pollinose middorsal stripe on worn abdomen in certain lights, not evident in the other specimens, and there are more black hairs than rust-red ones laterally on the abdomen.

Tabanus subjoidus, new species. Figure 119.

A dark reddish-brown species obviously related to the preceding and to *T. joidus* Bigot. Front narrow with a gradually narrowed callosity widely separated from the eyes, antennae with an acute tooth, palpi dirty yellow, blunt apically, tibiae whitish on the basal two thirds, and abdomen predominantly black haired.

Except that differences are constant, these specimens were at first thought to be variants of *T. palawanensis,* but they have a more brownish cast, the beard and chest hairs are more yellowish, the palpi more dirty yellow and not as sharp, and the fore tibiae

more whitish basally. *T. joidus* Bigot appears to average larger in size, to have a slightly wider front with oblong, more reddish callosity, the abdomen with more golden pubescence on the incisures and darker caudally. *T. subjoidus* may prove to be but an insular subspecies of *T. joidus*.

Description (holotype, female).—Length, 17 mm. Eyes bare, apparently entirely green without bands (relaxed). Front slightly narrowed below, index 1:8.5, golden-yellow pollinose, basal callosity blackish, rounded below and tapered gradually upward into a narrow median keel, attenuated a little short of the upper

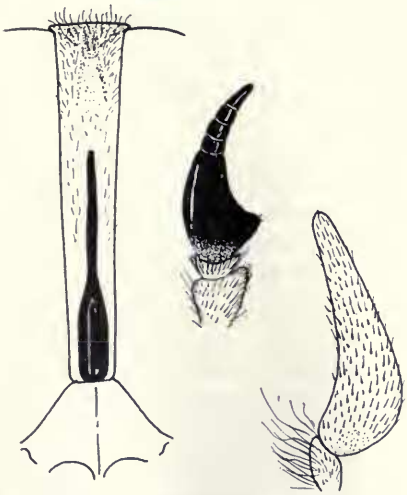

FIG. 119. *Tabanus subjoidus*, new sp.; front, antenna, and palp of female.

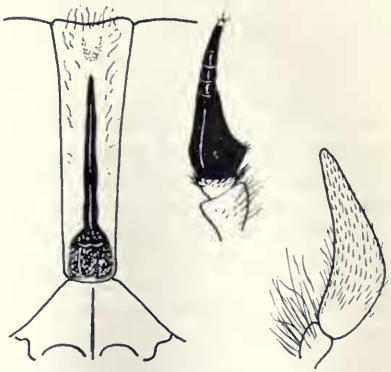

FIG. 120. *Tabanus attenuis*, new sp.; front, antenna, and palp of female.

third of the front. Subcallus and upper cheeks golden pollinose, face and lower cheeks buff-gray pollinose with straw-yellow beard. Antennae dark reddish, the annuli and basal hairs black; plate a third longer than wide and a third longer than the annuli, strongly excavated, the tooth acute. Palpi long and slender, dirty yellow, blunt apically and predominantly black haired. Proboscis black.

Thorax and scutellum dark brown, unlined, with appressed reddish, and short black hairs. Pleura, chest, and coxae buff pollinose and pilose with some brownish hairs above. Femora dark brownish with yellow hairs; some blackish hairs dorsally. Fore femora whitish with mostly concolorous hairs on the basal two thirds, black thereafter onto the tarsi. Mid and hind tibiae yellowish with mostly sparse black hair, the tips and tarsi blackish. Wings brownish, the costal cell and margins of radial veins darkest; cell R_5 wide open, no spur-veins. Subepaulets hairy, halteres reddish brown.

Abdomen reddish brown, predominantly black haired above and below; golden-yellow hairs in inconspicuous patches in the middle of tergites 3 to 5, and also scattered on the incisures anteriorly but more conspicuous caudad and on the

lateral edges of the segments; not strongly darkened caudally but with large, indefinite median darker brown shadings on the venter.

Holotype.—A female, Iwahig, Palawan Island, collected in June, 1945, by Jean Laffoon. In United States National Museum.

Paratypes.—Three females, same data, all 15 mm. and all agreeing closely (one in collection of CBP). Antennal plate in one is predominantly blackish like the annuli.

Tabanus attenuis, new species. Figure 120.

A medium-sized, patternless, ashy-gray species with unusual attenuation and extension of the last three abdominal segments, predominantly pale vestiture, parallel-sided front, clear wings, and black third antennal segments.

Description (holotype, female).—Length, 14.5 mm. Eyes ostensibly bare (microscopic hairs present under high magnification), dark green, unbanded (relaxed). Front moderately narrow, index 1:5.4, pale-gray pollinose with some buff tints mesally, vertex somewhat concave with a group of black hairs but no tubercle, basal callosity reddish, squared below, the upper margin rounded and dark brown, about as tall as wide and narrowly separated from the eye margins, the median extension dark brown, linear and attenuated at about the upper third of the front. Subcallus thinly buff pollinose. Face and cheeks whitish pollinose and pilose. Two basal segments of antennae reddish with black hairs, unswollen, the entire third segment black; plate slightly excavated, dorsal angle low and obtuse, length 1.3 times the height, but equal to that of annuli. Palpi pale flesh-colored, moderately robust and gradually tapered to a point, black haired with whitish pile on the first segment.

Thoracic integument brownish black, the antealar tubercles and some shadows on sutures and margins more reddish, all overlain by gray pollinosity and dense yellow and sparse black hairs. Scutellum concolorous. Pleura, chest, and coxae pale pollinose and pilose. Fore femora, distal thirds of fore tibiae and all tarsi dark brown; remainder of legs reddish, the femora predominantly whitish haired, the tibiae mostly black haired. Wings glass clear, the costal cells pale yellow, cells R_5 wide open, no spur-veins. Subepaulets hairy. Halteres yellow.

Abdomen ashy-gray pollinose, but little lighter than the thorax, with indefinite undershadings of brown sublaterally, not darkened caudally, mostly yellow haired above, entirely so below, with a few scattering black hairs on tergites, the incisures very narrowly paler; shape long and tapering, 1.4 longer than the head and thorax together, segments 5 to 7 attenuated (not just laterally compressed) like an ovipositor, the seventh tergite protruding, but little shorter than the sixth.

Holotype.—A female, east slope of Mount McKinley, 3,000 feet, Davao Province, Mindanao, collected in August, 1946, by H. Hoogstraal. In Chicago Natural History Museum.

Paratype.—A female, Palawan, Mindoro Island, no date, collected by P. de Mesa (in MCZ).

Remarks.—The elongated, ovipositor-like abdomen has developed independently but infrequently in divergent elements in the family. *Cydistomyia lamellata* Oldroyd of New Guinea even has the anal lamellae normally protruded, which is not true of the present species. *Hybomitra acuminata* (Loew) of Asia and the Middle East has the terminal segments compressed and was made the genotype of *Sipala* Enderlein on the basis of enlarged upper eye facets in the male. The Tribe Rhinomyzini in Africa has several members with ovipositor-like developments which Oldroyd (1954) has speculated may be adapted to breeding in rot-holes in trees and an arboreal existence.

T. attenuis has no close relatives in the Far East of which I am aware, though when known the female of *T. obconicus* Walker from central India may prove to have similar black flagellums and grayish brown abdomen; but *obconicus* has obscure, paired brown spots and faint though distinct clouds on the wing cross-veins and fork. The unknown female of *Cydistomyia platybasiannulatus* Sch. Stek. (new comb.) will also have some superficial resemblance, but the bare subepaulets and red antennae will at once separate this.

Tabanus conius, new species. Figure 121.

This is a medium-sized, gray dusty species with dull reddish abdomen, attenuated, but less markedly than the preceding, third antennal segments coal black, and glass-clear wings without spur-veins.

T. extricans Walker from Batchian Island is a related species with tapered abdomen. The flagellums are now missing from the type (BMNH) but were figured and described by Stekhoven (loc. cit.) as "brown at base, then black" and narrower than the "caplike" scape. It also differs in having palpi with black hairs and abdominal tergites 2 and 3 without the median maculae. When both sexes become available, these differences may prove to be variations in the same species.

Description (holotype, male).—Length, 14 mm. Head very large, much wider than thorax; eyes bare, the enlarged facets pale brown and sharply demarcated, occupying nearly three quarters of the total area, no dark median band, with "rolled under" edge to the vertex; tubercle in occipital notch small, very compressed and sunk well below the eye level, flanked by a short, erect row of pale yellow bristles behind the upper corners of the eyes. Frontal triangle buff pollinose, with brown apex. Face and cheeks pale-gray pollinose and pilose, the frontoclypeus deeply sunken. Beard almost white. First two segments of antennae reddish with sparse black hairs, third segment rather narrow, about as tall as scape and about twice as long, the annuli shorter, dorsal angle low and obtuse. Second palpal segments yellowish with pale hairs, evenly ovoid, about a third longer than thick. Proboscis blackish.

Notum and scutellum dusty gray pollinose, with three fine, brown lines almost to the prescutellum, covered with sparse fine brown, and fewer brassy, short hairs; the integument beneath probably is dark brown, and would give the thorax a much darker appearance in greasy specimens. Antealar tubercles dull, reddish. Pleura, chest, and coxae gray pollinose and almost whitish pilose. Fore femora and tarsi, and apical third of fore tibiae, dark brown. Remainder of legs bright reddish,

FIG. 121. *Tabanus conius*, new sp.; palp and profile of head of male.

pale-haired, sparse black hairs dorsally on the tibiae. Wings with yellow costal cells, venation normal. Subepaulets hairy. Halteres reddish.

Abdomen evenly conical, not constricted behind segment 4 as in the preceding species, but nevertheless unusually narrowed, and the seventh segment flattened, not tubular or unusually protruded; first three segments dull reddish with dusty-gray bloom, a narrow, blackish median stripe nearly crossing tergite 2, and an indistinct median shadow on the basal half of tergite 3; tergites 4 to 7 darkened basally with wide yellowish incisures *not* accentuated by yellow hairs; inconspicuous vestiture predominantly dark, with scattered yellow hairs especially on the outer corners. Color of venter essentially the same, with larger dusty blotches

in the middle of sternites 2 and 3; vestiture predominantly pale yellow to sternite 4, dark thereafter.

Holotype.—A male, Isle Biliran, collected in 1927, by C. F. Baker. In United States National Museum.

Remarks.—Description of males of *Tabanus* without females is unsatisfactory. Nevertheless, the gray, dusty appearance coupled with conical abdomen and dark line on tergite 2, black flagellums and clear wings does not resemble any species in the Far East that I could find other than *T. extricans* Walker, discussed above. This can hardly be the male of *T. attenuis,* new sp., because of the paler body with redder abdomen, and palpi without black hairs. It is possible, however, that the unknown female will have a similar though paler appearance than the female of *T. attenuis.* The coal black plates obviously relate the two species.

The IMMANIS Group

There is in the Orient and East Indies, a group of large reddish flies superficially resembling the robust *bovinus* group of Europe and related to what Stekhoven treated under his *immanis* group (XIV); the group should include his *T. auricingulatus* from Sumatra and *T. 5-triangularis* from Mindoro. Further comments are made under the latter name (p. 595). Since some of the East Indies species, particularly *T. immanis* Wiedemann and *T. fumifer* Walker, are common and variable, it would not be surprising if related elements had expanded into the Philippine Archipelago via the Palawan or Sulu bridges in paleogeologic times (see Dickerson, 1928). The rather meager material at my disposal showed that several related species are now present, and more extensive knowledge of both sexes, as well as a decision as to diagnostic reliability of the eye pattern, will be necessary before it can be decided (1) to what extent available names are applicable, or (2) if some of these represent recent, precinctive developments in the Philippine Archipelago as indicated by observations on the other tabanid faunas. Assignments to certain of the following species can therefore be made only tentatively at present.

Kröber's (1934) Manila record for *T. fumifer* needs to be confirmed; he also (1924) credits this species to "Philippinen" without locality.

Tabanus immanis Wiedemann

Tabanus immanis Wiedemann, 1828, Auss. Zweifl. Ins., **1**: 123—Java.

Tabanus univentris Walker, 1848, List Dipt., **1**: 151—Malaya.

?Tabanus dives Rondani, 1875, Ann. Mus. Civ. Genova, **7**: 457—Borneo.

I have not with certainty recognized this variable, common East Indian and Malayan species among Philippine material at hand. Only one specimen of the group discussed by Stekhoven (1926), with eyes divided into upper purple and lower green areas (relaxed) has been found. This specimen was taken on Samar with *T. unifasciens*, new sp. (p. 592). It differs from the latter in minor respects: the femora are blackish and the anterior tibiae are dirty whitish on the basal halves, the posterior tibiae are more reddish, the tergal incisures are black haired, not golden yellow, on each side of the triangles, which are flatter and more expanded along the hind margins, and the callosity is ovoid, not triangular. On account of blackish pile on face and cheeks, pleura, and legs, and black hairs predominantly on edges of tergites, it appears possible that this is a melanistic *T. immanis*.

Material examined.—One female, Osmeña, Samar, collected in August, 1945, by Jean Laffoon (USNM); one female, same locality, collected May 4, 1945, by K. L. Knight, in laboratory (LER collection); one female, Zamboanga, Mindanao, collected in September, 1945, by Jean Laffoon (USNM).

Remarks.—As Stekhoven has pointed out, in the East Indies area the group of *fumifer-immanis* is a difficult and variable one, and rearing may be the only solution to adequate identification.

Tabanus malayensis Ricardo

Tabanus malayensis Ricardo, 1911, Rec. Ind. Mus., 4: 178—Malaya.

This was redescribed by Kröber (1924) in his report on Philippine species and compared to his *T. philippinensis*, but without statement of its occurrence in "Philippinen" as he did with other species.

Tabanus subimmanis, new species. Figure 122.

This is a reddish brown, medium-sized species with darker thorax, middorsal row of pale, equilateral triangles, incisures not pale, that was at first considered to be a variant of the variable *T. immanis* Wiedemann. However, this differs from such related species as *T. immanis* and *T. angustitriangularis* Sch. Stek. in the eyes with single purple band (see Stekhoven's Group XIV, 1926, with eyes half purple, half green) and in the dark, lentiform spots above the triangles. In Stekhoven's Group XIII, *T. monilifer* Bigot has a wider front, and *T. atrisignatus* Sch. Stek., *T. spoliatus* Walker, and *T. soembawensis* Sch. Stek. have pale incisures. *T. mentitus* Walker from China might be the male of *subimmanis*, but it is inadequately described and it differs in having palpi mostly yellow haired.

Description (holotype, female).—Length, 16 mm. Eyes bare, green with a single median purple band (relaxed). Front narrow, slightly divergent above, index 1:9.4, brown pollinose with short black hairs; basal callosity reddish brown, rounded below and narrowly separated from the subcallus and ocular margins, a median sulcus tapering gradually into a strong, brown median keel which reaches to the upper third of the front. Subcallus and upper cheeks yellow pollinose grading into pale buff face and cheeks, the beard pale yellow. Antennae dark reddish, darkening distally on the plate to blackish annuli; scapes black haired, not swollen; plates half again longer than wide, and a little longer than the

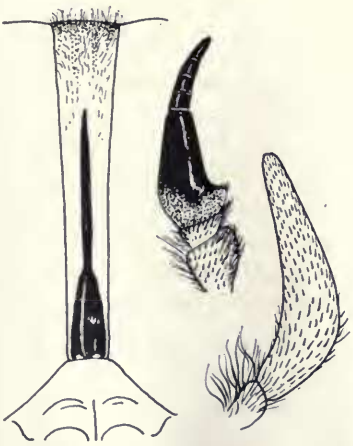

FIG. 122. *Tabanus subimmanis*, new sp.; front, antenna, and palp of female.

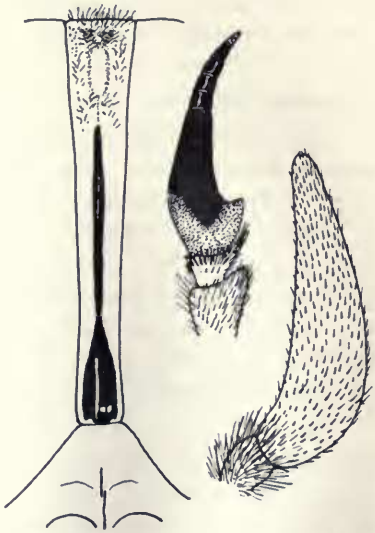

FIG. 123. *Tabanus unifasciens*, new sp.; front, antenna, and palp of female.

annuli, moderately excavated, the dorsal teeth low and not quite rectangulate. Palpi moderately robust, nearly as long as the stylets, gradually tapered to blunt apexes, mostly black haired on the second segment, the first with yellowish pile.

Thorax and scutellum brownish black with mostly short yellow hairs and sparse black ones, the antealar tubercles reddish. Pleura smoky gray with yellow-brown hairs, creamy pile below on chest and coxae. Femora brown dorsally with black hairs, reddish below with yellowish hairs; fore tibiae on distal third and all tarsi blackish; remainder of tibiae reddish with concolorous hairs ventrally, black ones dorsally including hind tibial fringe. Wings brown, a little lighter behind, cells R_5 wide open, no spur-veins. Subepaulets hairy. Halteres brown, yellow on the knobs.

Abdomen dark reddish, the last three tergites predominantly black with pale incisures; predominantly black haired with small, equilateral, pale yellow haired and pollinose triangles in a median row, not expanded along the incisures, and yellow haired outer corners; dull integumental, ovoid black spots above the triangles on tergites 2 to 4. Venter red, the last two sternites black, yellow haired

laterally and black hairs in a median band, the incisures narrowly yellow haired.

Holotype.—A female, Bacungan, Puerto Princessa, at sea level, Palawan Province, Palawan Island, collected March 22–27, 1947, by F. G. Werner. In Chicago Natural History Museum.

Paratypes.—Three females, same data, 15–17 mm. (one in collection of CBP). In essential agreement. The middorsal triangles are less prominent in greasy specimens. The narrow purple eye band was not revived in one specimen and the lower corners of the callosity were not rounded but practically touched the eyes in another.

Tabanus unifasciens, new species. Figure 123.

This species resembles the preceding one in size, narrow front, general brownish red color with a row of low, yellow triangles and single purple eye stripe on a greenish ground. This differs, however, in usually darker, sooty-brown beard, callosity usually long oval or club-shaped, rather than triangular, subcallus with narrow brown band across apex under callosity, antennal plates usually with more prominent or acute tooth, the incisures narrowly golden-yellow pollinose and pilose above as well as below, and the low triangles not as pale yellow and flatter in appearance because of the pale incisures.

Variants of *T. fumifer* Walker with yellow-brown beards discussed by Stekhoven (1926) must be close, but the eyes of the females, purple on the upper half, and of the males, with larger, more extensive enlarged facets, are fundamentally different, and there is no mention of the black integumental spots above the yellow triangles on tergites 2 and 3. *T. parallelifrons, T. malayensis,* and *T. brunnicolor* (syn. *brunneus*) also have such black spots but either the eyes are purple in the upper half and the incisures are not yellow, or the thorax is black-brown lined. Though the integument of the incisures in related species may appear as narrow pale bands, the hairs between the median triangle and outer corners are predominantly to entirely black.

Description (holotype, female).—Length, 19 mm. Eyes bare. Front narrow, moderately divergent above, index 1:10.8, yellow pollinose with short black hairs, an ashy gray V at the vertex. Subcallus, face, and cheeks brown, with gray shadings below the antennae and dark brown pile on face and beard. Antennae basally black haired, and deep red to the dorsal tooth, blackish thereafter, plate rather slender, nearly twice longer than thick, the tooth low, the excision rectangular, the annuli longer than the basal width of the plate. Palpi robust, dirty yellow, tapering gradually to a blunt apex, entirely black haired including the basal segment. Proboscis black.

Notum, scutellum, and antealar tubercles blackish brown with three indistinct, narrow, brown lines anteriorly, covered with short black and deep brassy hairs.

Pleura, chest, and coxae olive brown with mostly dark brown pile. Legs dark reddish with black hairs, some yellow pile on the inner faces of the two hind pairs of femora, the fore tibiae almost unicolorous and but little darkened apically, tarsi black. Wings brownish, accentuated along the vein margins and in the costal cells; cell R_5 open, no spur-veins. Subepaulets hairy. Halteres brown, yellow on the apical seams.

Abdomen deep reddish brown, black haired and with median black integumental spots on all segments (narrowest on tergite 2), which expand behind to include most of tergite 4 and all of the remaining tergites; incisures 2 to 6 rather narrowly yellowish red with rufous hairs which expand into low median triangles about one third the length of tergites 2 to 5; a median patch and scattered golden hairs on the incisure of tergite 1; tergite 7 entirely black; edges of tergites black haired except for golden haired incisural corners. Venter similarly colored but without median pale triangles.

Allotype (male): Length, 18 mm. Colored similarly to the holotype but the black spots on segments 2, 3, and 4 above and below not as extensive, and the outer edges of tergites, including lower corners, entirely dark haired. Eyes bare, the upper facets hardly enlarged and no line of demarcation; head therefore about the same size as in the female, and like it with a single broad purple band on greenish ground. Tubercle in occipital notch prominent, ovoid, blackish and raised above the upper eye level. Frontal triangle yellow pollinose, with wide brown band across the apical third. Face strongly sunken, buff-gray pollinose. Cheeks pale gray brown, more brownish along the eye margin, pale brown pilose. Antennae narrower than in the female, the plate mostly reddish. Palpi yellow, chunky, scarcely half again longer than wide, thickest in the outer third, with blunt apical nipples, black haired on both segments. Legs including fore tibiae more uniformly pale brown, entirely black haired.

Holotype.—A female, Osmeña, Samar, collected on April 20, 1945, on carabao, by L. E. Rozeboom. In collection of C. B. Philip, through generosity of collector.

Allotype.—Same locality data as holotype but collected in July, by Jean Laffoon (in USNM).

Paratypes.—Two females, same data as holotype (one taken in July), but collected by Laffoon and Schultz; one male, Tangcolan, Bukidnon, Mindanao, collected in 1927, by C. F. Baker; 15 females, Luzon, Samar, Sibuyan, Negros, and Mindanao Islands, collected in 1927, by C. F. Baker; 2 females, Casagivean, Tayabas, Luzon, collected by R. C. MacGregor (USNM, CNHM, and collection of CBP; det. by Surcouf as *T. fumifer* Walker or *T. factiosus* Walker); one male, Mount Pinatuba, Luzon, 5,600 feet, collected in April, 1907, by J. C. Thompson (CAS); one female, Antiyao River, Samar Island, collected June 4–6, 1910, by J. J. Mounsey and C. J. Wainwright (BMNH). Frontal indexes 1:9.7 to 10.8. No eye colors could be revived in one Osmeña specimen and another was more melanistic, the antennae and palpi being almost blackish. The Sibuyan and Mindanao specimens, also with single eye stripes, had more flesh-

colored palpi, more reddish legs, and venter without as distinct dark median patches. The excision of the antennal plate was more acute in three specimens. In a few specimens, the callosities were more angulate than rounded below where the corners appeared to touch the eye margins as in variations of *palawanensis*.

Tabanus factiosus Walker

Tabanus factiosus Walker, 1859, Proc. Linn. Soc. London, **4**: 102—Celebes.

Two females reported from "Negros, Philippines," by Ricardo (1911) were compared to the two syntype females, and found to be very close; they differ only in being smaller (18 mm. compared to 22 mm.) and the abdomen is more brick-red with less tall triangles and yellow rather than gray incisures. Whether this difference is specific cannot be decided. No other specimens were seen in the material at hand.

Tabanus philippinensis Kröber

Tabanus philippinensis Kröber, 1924, Arch. Naturg., **90**, Abt. A, Heft 1, p. 25.

A large (18.5–20 mm.), dark species with reddish-brown abdomen with row of low, yellow triangles expanding on the incisures, related to the preceding but with unicolorous, reddish fore tibiae, brownish-tinged wings, and blackish thorax. Female, but number of specimens and type locality not stated (see pp. 619, 620). The above two Negros specimens may belong here rather than in *factiosus*.

Tabanus melanopygatus Bigot

Tabanus melanopygatus Bigot, 1892, Mem. Soc. Zool. France, **5**: 651—Indie orientale.

Presence of this Indian species in the Philippines is implied though not stated by Kröber (1924), while Formosan specimens suggest to him that the name should be revived from synonymy under *T. fulvimedius* Walker. Kröber's medium-sized specimens had parallel-sided, rather wide fronts (index about 1:5), the black callosities their full width, reddish abdomens with low yellow triangles, and reddish legs with only the fore femora and apex of fore tibiae dark (see pp. 619, 620).

Tabanus dissimilis Ricardo

Tabanus dissimilis Ricardo, 1911, Rec. Ind. Mus., **4**: 180—Malaya.

Though both specimens listed below have the characteristic white triangles on the abdomen, the Borneo female has a purplish-red body

color while the Philippine female is more brownish red, and has the third antennal segment almost completely black and a frontal index of 1:10.9. The wings are more hyaline than in related species.

The male has not been described and one is assigned here with doubt. It has the characteristic, nearly hyaline wings, and white hairs of beard, chest, sides of tergites, and triangles, but the latter are not flattened or extended along the incisures, and the venter is entirely white haired without median black patches. The enlarged facets occupy over two thirds of the total eye area, but there is an occipital margin of small facets to the vertex. Also, a purple stripe is present along the lower margin of the enlarged facets (relaxed). The triangles are not tall enough for *T. indianus*, and the male described by Shiraki (1918) from Formosa (Taiwan) does not agree with the present specimen. The enlarged facets and white beard chiefly distinguish this from the male discussed under *T. neoindianus*.

Material examined.—One female, Victorias, Negros Occidentale, collected July 3, 1928, at light (USNM); one female, Kuching, Borneo, no other data (in collection of CBP); one male (det. ?), Osmeña, Samar, collected in August, 1945, by Jean Laffoon (USNM).

Tabanus 5-triangularis Schuurmans Stekhoven

Tabanus 5-triangularis Sch. Stek., 1932, Arch. Naturg., (N.F.), 1: 73–74.

The type in Halle Museum came from Mindoro Island as did that of the following new species, *T. negritos*. The former differs in its larger size (21 mm.), darker, less reddish abdomen with a median row of black, black-haired spots on the venter, and blunter, less tapered palpi. Because the eye colors of *T. 5-triangularis* were not stated, the following specimens can only tentatively be associated here. All have unicolorous bluish-green eyes (relaxed), and agree with the description in having pale, whitish yellow beards, dark reddish-brown abdomens, median dark spots, though not sharply defined, on tergites 2 to 4, and on the venter, and antennal plates mostly black with acute teeth, but these specimens are smaller (17–19 mm.), the fronts are a little wider (1:9.3–10.4, compared to 1:11.5), and the thoraxes are darker, without noticeable brown.

Two Negros males, also tentatively assigned here because of identical locality data, agree in most respects; the upper eye facets are sharply enlarged in one, less so in the other, and the abdomens are more reddish with paler, almost whitish incisures and triangles, no dorso-median spots, and in the first, midventral patches of black hairs overlie pale brown, not black, spots. These specimens are un-

doubtedly related to the variable *T. fumifer* Walker of the East Indies, of which no material is available for comparison, but which species was familiar to Stekhoven when he described this.

Material examined.—One female, Cuernos Mountains, "Negros," collected by C. F. Baker, 1927 (USNM); one male, one female, Dumaguete, Negros Orientale, no date, collected by C. T. Brues (MCZ); one male, 2 females, Mount Canlaon, Negros Orientale, 3600–4200 feet, collected April 30 and May 1, 1953, by H. M. and D. Townes (LLP); one female, Zamboanga, Mindanao, collected in September, 1945, by Jean Laffoon (USNM); one female, Osmeña, Samar, collected May 4, 1945, by Kenneth Knight (CBP); 2 females, same locality, collected in April and August, 1945, by Jean Laffoon (USNM).

Tabanus negritos, new species. Figure 124.

A medium-sized, bright reddish species with small median black spots on the abdomen above, and low, yellow-haired triangles which are the expansions of prominent yellow incisures. Venter mostly golden-yellow haired and entirely bright reddish without black median spots. Front very narrow, callosity club-shaped, eyes with a single narrow purple band on green ground.

This was at first thought to be a bright variant of *T. subimmanis* on account of the eye band and median though smaller black spots on the abdomen. It differs, however, in snow-white beard, chest, and forecoxal pile, callosity blackish, ovoid and rounded below rather than a tall triangle; blackish femora, brighter red abdomen with abundant yellow hairs on wide incisure and venter without dark median spots, and less strongly tinted wings. The larger *T. fuscomaculatus* Ricardo, from Burma, has larger, median black spots on the abdomen, pale yellowish beard, spur-veins and less prominent incisures. It is perhaps closest to the common and variable *T. fumifer* Walker, but that species is darker red, has the upper half of the eyes purplish blue, has a more yellowish beard, and lacks the black, median abdominal spots.

Description (holotype, female).—Length, 16.5 mm. Eyes bare. Front very narrow, practically parallel-sided, index 1:10.0, yellowish pollinose with an evanescent, smoky V at the vertex; callosity club-shaped or tall ovoid, narrowly separated from the eye margins, deep blackish brown, rapidly tapered above into a slender, dark keel attenuated at the upper third of the front. Subcallus and upper cheeks yellowish pollinose, a peculiar evanescent "sun-burst"-like gray half circle at the top beneath the callosity with downward-projected gray rays which disappear on dorsal view; the pattern is symmetrical and is not due to wear. Lower face and cheeks white pollinose and pilose. First two segments of the antennae

and extreme base of third, deep reddish, black haired; plate mostly blackish, longer than style, and dorso-basal tooth low, obtuse. Palpi long and slender, but little thickened basally, dirty yellowish with black hairs, blunt at the apex.

Notum and scutellum ashy-gray with suggestions of three narrow brown lines anteriorly, covered with brassy yellow and sparse black hairs. Antealar tubercles reddish with black and yellow hairs. Pleura gray with pale and a few black hairs.

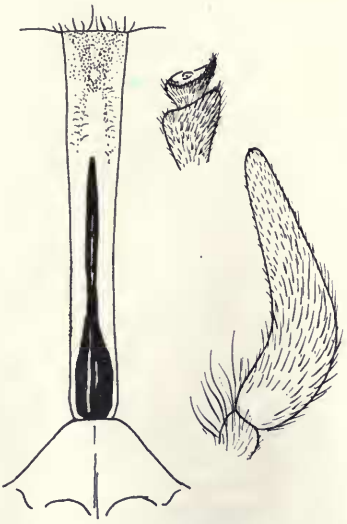

FIG. 124. *Tabanus negritos*, new sp.; front, two basal segments of antenna, and palp of female.

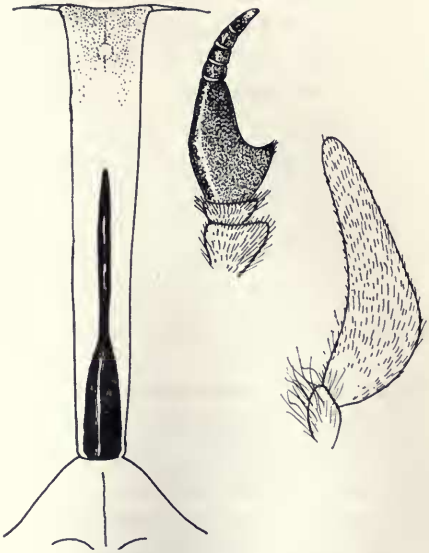

FIG. 125. *Tabanus neoindianus*, new sp.; front, antenna, and palp of female.

Chest and coxae with whitish hairs. Femora deep brown, almost black, the two hind pairs reddish on the distal fourth, yellow haired with a few black ones dorsally. Tibiae bright reddish, the fore pair black on the distal third, mostly yellow haired with scattered black hairs especially apically, the hind tibial fringe black. Tarsi dark brown, the fore pair black. Wings tinted but not as deeply as in related species, the costal cell and veins yellow. Cell R_5 wide open, no spur-veins. Subepaulets hairy. Halteres brown, the seams orange.

Abdomen bright brick-red basally, increasingly black caudad of tergite 4, tergite 7 entirely black without pale incisure; a tall, narrow, conspicuous, conical spot occupying the middle two thirds of length of tergite 2 above the triangle, and a smaller one on tergite 3; larger half-moon-shaped spots based anteriorly on 4 and 5, indented behind by golden-haired triangles. Incisures of tergites 2 to 6 broadly yellow and with golden-yellow hairs which expand into low, median triangles on all but 6, and laterally along the sides. Venter concolorous with the dorsum, mostly bright yellow haired, a few inconspicuous black hairs on sternites 4 and 5, increasing caudad.

Allotype (male): Length, 16.5 mm. Closely resembles the female except for the usual sexual differences. Eye facets but little differentiated in the upper half,

the dividing line hardly differentiated. Tubercle in occipital notch, small, ovoid, a little above eye level. Frontal triangle buff pollinose, brown in apical third, without the dependent rays seen in female and beards more buff than white. Face deeply sunken below antennae. Palpi yellow, subovoid with black hairs, half again longer than thick. Abdominal pattern similar to female, but pile on thorax more abundant.

Holotype.—A female, Labangan River, near San José, Mindoro, collected April 10, 1945, by C. B. Philip. In collection of C. B. Philip.

Allotype.—A male, San José, Mindoro, collected March 13, 1945, by Ross and Skinner (in CAS).

Paratypes.—Four males, 11 females, same data as allotype but various dates in March, April, and May (in CAS, CNHM, and collections of CBP and LLP); one female, San José, Mindoro, collected in February, 1945, by E. S. Ross (in CAS).

Remarks.—Named for the Mangyan pygmy tribe of Negritos natives inhabiting the hills of Mindoro where this fly was taken. The species is probably an unwelcome acquaintance of theirs.

Tabanus neoindianus, new species. Figure 125.

This is distinguished from related brown-bodied species of the *fumifer–immanis* group by the combination of prominent white triangles almost crossing the segments, pale, white-haired tibiae on the basal halves, and blackish, immaculate eyes (relaxed).

Stekhoven (1926) doubted that Formosan females assigned by Ricardo (1911) to her *T. indianus* from India were actually conspecific. Only one rather denuded but not discolored specimen of the group is available from the Philippines. It differs from the type of *T. indianus* in having black callosity and antennae, the third segment of which is shorter and chunkier, the fore tibiae pale on less than the basal half, the thorax not brownish even on the scutellum and antealar tubercles, but entirely ash gray to blackish, the abdomen pale reddish yellow with dark integumental spots above or around the white triangles, and pale-haired incisures on tergites 4 to 6. It differs from Formosan specimens in its entirely black, third antennal segments, annuli shorter than plates, and possibly narrower front, index 1:8.8 (Shiraki gives 1:8, Stekhoven 1:6.1).

The taller white triangles, more compact antennae and callosity isolated from eye margins separate this from *T. dissimilis* Ricardo. *T. negritos* also has a white beard but the eye and abdominal patterns are quite different.

Description (holotype, female).—Length, 19 mm. Eyes bare. Front yellow pollinose, ash gray at vertex, slightly narrowed below; index 1:8.8. Callosity black,

smooth, unfurrowed, tall, triangular and tapered into a rather narrow black keel which reaches half way to vertex. Subcallus and upper cheeks yellow pollinose. Face and cheeks gray pollinose, and beard white, a few dark hairs above. Two basal segments of antennae dark brown, black haired, the third rather compact, the plate 1.7 times longer than wide and 1.6 times longer than the annuli, entirely black except for a very small reddish spot at extreme base. Palpi dirty yellow, covered with black hairs on the second segment, moderately swollen basally and tapering to an obtuse point. Proboscis black.

Entire thorax, coxae, and two hind pairs of femora heavily ashy-gray pollinose and, where not denuded, mostly whitish pilose. Antealar tubercles the same with a small reddish shadow on the disc, black haired. Fore femora blackish gray pollinose below, and predominantly black haired. Fore tibiae on basal halves pale yellow with white and a few black hairs; the apical halves, tips of two hind pairs of tibiae and all tarsi blackish; mid and hind tibiae mostly bright reddish with sparse pale hairs below, and black ones on the dorsal edges. Wings more faintly tinted than in most of the group, the costal cells pale yellow, the vein margins slightly, if at all, accentuated in the radial sector; cell R_5 wide open, no spur-veins. Subepaulets hairy.

Abdomen pale reddish yellow on the first three tergites, darkening thereafter to the entirely black seventh tergite; only a few hairs remain to suggest the dorsum as predominantly black haired, with scattered pale hairs on the incisures of tergites 2 and 3 but pronounced bands on margins of 4 to 6; triangles indicated by sharply outlined pale yellow pollinosity, those on 3 to 6 equilateral and nearly reaching anterior margins, dark integumental shadows surrounding the apexes of triangles on 2 to 4, tergites 5 and 6 entirely black on either side of the triangles, except for the pale incisures; the triangle on 6 proportionately as distinct as that on 5 (typical *indianus* has only a trace on 6). Venter reddish yellow with paler incisures, yellow haired, with a median row of brownish-black haired, half-moon patches; sternite 6 black with yellow incisure, 7 completely black.

Holotype.—A female, Mati, Davao Province, Mindanao, collected in May, 1927, by F. Rivera. In United States National Museum.

Remarks.—I agree with Stekhoven in doubting the specific relationship of these insular forms to *T. indianus*, but the question cannot be resolved until more material of both forms, including possibly a third form on Taiwan, is available.

A possible male ("Masugbu, Bat. [Bataan?], III–13–54, H. Townes," in collection of LLP) has similar tall triangles with the apices of those on tergites 2 to 4 disappearing on the upper halves in narrow, sharply outlined black spots; the triangle on tergite 6 is much reduced. This specimen differs from the type female in pale yellow beard, fore tibiae pale reddish on basal two thirds, heavy gray pollinosity not so evident on thorax and upper legs, and venter predominantly black haired except on incisures with no half-moon spots. It has the same subhyaline wings and predominantly black antennal plates with acute teeth and shorter annuli. Eyes unicolorous, dark greenish, the facets not perceptibly enlarged above. Palpi thickened apically, without nipples.

Tabanus hoogstraali, new species. Figure 126.

A rather large, chestnut-brown species related to *T. incultus* Sch. Stek. of Sumatra with narrow front (index 1:10.1), and low, rather indistinct, coppery-yellow haired triangles not extending laterally on the incisures. This differs in the full width callosity on the front (an unusual feature in this group of flies), the wider, more compact antennae, more yellowish palpi, darker brown beard, entirely black-haired sides of tergites 4 to 6, venter without a distinct black median band, and glass-clear wings with brown costal cells and red veins. The clear wings at once distinguish this species from *T. succurvus* Walker and *T. ceramensis* Sch. Stek. of the East Indies, which also have dark beards. *T. dissimilis* Ricardo and *T. ignobilis* Rondani also have wide callosities and fairly clear wings but the triangles and beard are white haired and the antennae are more slender.

Description (holotype, female).—Length, 18 mm. Eyes bare, entirely black on attempted revival of pattern. Front brown pollinose, slightly widened above, callosity dark red touching the eye margins nearly half its length, tridentate across the top, two smoky pollinose lines continuing upward from the two corner prongs and the middle one continuing as a narrow, dark red keel to just above the middle of the front. Subcallus yellow to brown pollinose on the upper two thirds in different lights, with two broad collars of golden tomentum above the antennal fossae. Face buff gray with brown hairs. Cheeks pale brown above grading to gray below, the beard brown. Antennae dark red, and black haired basally, the plates chestnut red, the annuli sharply black; plates compact, about a third longer than wide and a fourth longer than the annuli, strongly excised dorsally, the tooth sharp, quadrangular. Palpi dull yellow, the second segment black haired, and rather thickened basally, tapering to a rather sharp point. Proboscis brownish black.

Notum somewhat denuded, blackish with gray pollinosity, scutellum concolorous, antealar tubercles flesh colored, brown shadings on the margins above the wings and indistinctly on the scutellum. Pleura buff and black haired above, ashy-gray and creamy haired below. Fore coxae gray with pale brown hairs, hind pair black haired. Femora dark reddish-brown, mostly black or brown haired, tibiae a little more reddish with black hairs, the fore pair darkened on distal third. Wings with only the basal cells with some tinting, cells R_5 open, no spur-veins. Subepaulets hairy. Halteres with brown stalks and pale yellow knobs.

Abdomen dark reddish-brown, but little darkened caudally, predominantly black haired without paler incisures except for a median row of low, gray pollinose triangles, mostly denuded but a few coppery yellow hairs remaining to indicate original low triangles; a few yellowish hairs on the extreme sides of the first three tergites, entirely black on the remainder. Venter dark reddish with indefinite browner shadows mesally, mostly black haired; a few yellow ones on the first three sternites.

Holotype.—A female, Dimaniang, Busuanga Island, Calamian Group, collected in March, 1947, by H. Hoogstraal. Near sea level in dry, second-growth forest, resting on vine. In Chicago Natural History Museum.

Remarks.—Named for the collector, a friend with whom I have enjoyed collecting in various parts of the world.

Tabanus pellus, new species. Figure 127.

A large, dusky, brownish-black species with concolorous vestiture and appendages, clear wings and no prominent markings. Obscure, low, pale-yellow pollinose triangles may be seen in certain lights on

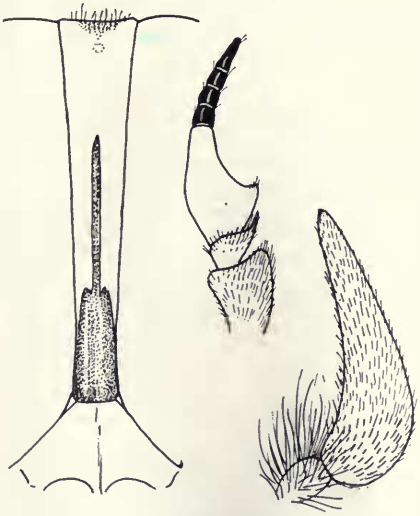

FIG. 126. *Tabanus hoogstraali,* new sp.; front, antenna, and palp of female.

FIG. 127. *Tabanus pellus,* new sp.; antenna and palp of male.

the median, hind margins of tergites 2 to 5, with mostly black hairs but a few yellow ones. These might be more evident in the unknown females, but the abdomen of this male appears essentially unicolorous.

T. macfarlanei Ricardo from Hong Kong differs in having more obtuse antennal tooth, black, not brown beard, and apical shadows on the wings. *T. atripilosus* Sch. Stek. from Sumatra has black vestiture and wing veins with brown shadows. Neither is mentioned as having the obscure triangles on the abdomen though the latter is "slightly paler at the segmentations." The possibility of this being a dark male of *T. hoogstraali,* new sp., was entertained because of the obscure triangles but that has a redder abdomen, grayer thorax and paler vestiture beneath.

Description (holotype, male).—Length, 19 mm. Head very large, semicircular, eyes bare, black unbanded (relaxed), the enlarged facets sharply demarcated in the upper two thirds, the lower margin sinuous outwardly, a wide occipital margin of

small facets to the vertex and rolled over the hind margin. Tubercle in occipital notch, brown, thin, compressed, level with eyes. Frontal triangle deep, golden brown, darker in the apical third. Face and cheeks brown with sooty brown pile and beard, the frontoclypeus deeply sunken below the antennae. Basal segments of antennae deep reddish with black hairs, the flagellum black, very slender, the plate deeply excised, the tooth acute, a little longer than the annuli. Palpi yellowish brown with black pile, blunt apically and thickest in the distal half. Proboscis black.

Thorax and scutellum dull chocolate brown with brown hairs, a few scattered yellow hairs around the margins, especially anteriorly. Legs blackish brown with brown to black hairs, the two hind pairs of tibiae a little paler. Wings subhyaline, the costal cells pale yellow. No spur-veins, cell R_5 open. Subepaulets hairy. Halteres brown, pale yellow on the seams.

Abdomen deep, velvety red-brown with thick black vestiture above and below.

Holotype.—A male, Victorias, Negros Occidentale, collected January 23, 1928, at light. In United States National Museum.

Remarks.—A damaged male (18 mm.) from Santa Fe, Bukidnon, Mindanao, may be the same, but I am not certain of this. It has suggestions of more yellow hairs on the notum and narrowly on abdominal sutures above and below, and is in poor condition (in CAS).

Tabanus griseoscutellatus Kröber

Tabanus griseoscutellatus Kröber, 1924, Arch. Naturg., 90, Abt. A, Heft 1, p. 27.

A rather large (16 mm.), blackish species with dark brown abdomen; related to the preceding, but smaller, with fumose wings and pale gray pollinosity on the scutellum. Male, no type locality.

Tabanus alticolus, new species. Figure 128.

Resembles *T. palawanensis* (p. 583) but has a single green eye stripe on coppery-blue ground, more divergent front above with a more bulbous, ovoid callosity, uniformly orange-red legs, and venter with a few pale yellow hairs. Abdominal triangles are wanting or represented by small, or indistinct, median patches of yellow hairs.

Description (holotype, female).—Length, 15 mm. Eyes bare. Front dark gray pollinose, narrowed below, index 1:6.3, callosity mahogany brown, smooth and swollen, ovoid, barely separated from the eye margins, abruptly narrowed into a narrow keel to the upper third of the front. Subcallus brown pollinose with a pair of small, chocolate-brown spots at the top, beneath the callosity. Face and cheeks pale yellow pollinose and pilose. Two basal segments of antennae dark red, and black haired, third segments black, plate hardly excised, the tooth low but sharp, longer than wide but about equal to the annuli. Palpi long and slender, flesh-pink with black and some pale hairs, somewhat thickened basally.

Notum discolored and black, due to wear, but probably ash-gray pollinose, lateral borders pale reddish continuing onto the margins of the scutellum. Pleura,

chest, and coxae gray pollinose with pale yellow hairs. Tarsi darkened at the tips. Wings pale-yellow-tinted with yellow veins and costal cells; cell R_5 open, no spur-veins. Subepaulets hairy. Halteres orange yellow.

Abdomen uniformly brick red, slightly darkened caudally, covered with rather long black hairs, especially on tergite 1; scattered pale yellow hairs anteriorly on tergite 1, on the extreme lateral margins of all segments, and on the incisures and as indistinct, median patches on the first four tergites.

Holotype.—A female, Mount Data, Mountain Province, Luzon, Baguio-Bontag Road, about 7000 feet, collected April 23, 1946, by

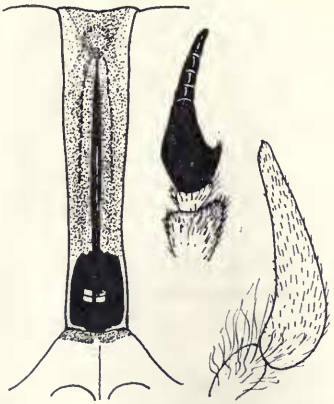

FIG. 128. *Tabanus alticolus*, new sp.; front, antenna, and palp of female.

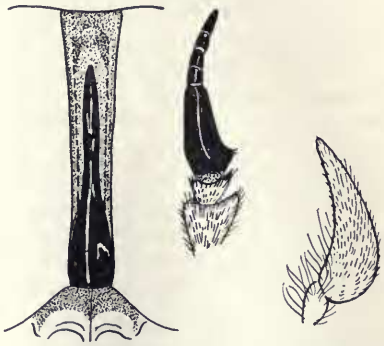

FIG. 129. *Tabanus provocans*, new sp.; front, antenna, and palp of female.

H. Hoogstraal. Near small stream in pine forest. In Chicago Natural History Museum.

Remarks.—This is another of the Philippine species with the single eye stripes, though the colors appear to be reversed on revival.

Tabanus provocans, new species. Figure 129.

This rather small species with reddish, pale-banded abdomen, long, slender, black antennae, and wings with an apical cloud was assigned to *T. fuscicauda* Bigot from Ceylon by Surcouf (USNM). This is not even a close guess because of the smaller size, wider front with entire callosity touching the eyes, narrow, blackish antennae, paler legs, wings not clear, and no median black spots on the abdomen. There are pale yellow incisures in the integument, however. On the abdomen there are median patches of yellow hairs that are easily obliterated by wear and which extend forward of the pale bands. Of the species reviewed by Ricardo (1911) it appears closest to

T. consanguineus Macquart, but (among other differences) that species has clear wings and darker abdomen. *T. provocans* appears to have no East Indian relatives.

Description (holotype, female).—Length, 11.5 mm. Eyes bare, a single, heavy purple band on green ground (relaxed). Front parallel-sided, index 1:6.8, gray pollinose, callosity and stout median callus mahogany-brown, the callosity filling the lower portion of the front, gradually tapered into a heavy median keel which reaches to the upper fourth of the front. Subcallus peculiar, small, a narrow brown band under the callosity, then an ash-gray band which is lighter viewed from above, and a wide yellow pair of curved bands over the antennal fossae. Face and cheeks whitish pollinose and pilose. Antennae long and slender, the basal segments dark red, black haired, the third segment over twice longer than wide and a little longer than the annuli, the dorsal margin sinuous and the tooth low, obtuse. Palpi dull yellow, stout at base and pointed apically, black haired. Proboscis yellowish brown.

Notum and scutellum ash-gray pollinose with short yellow and black hairs. Pleura, chest, and coxae gray pollinose and pilose. Legs reddish, the fore and hind femora, apical thirds of fore tibiae, and all tarsi a little darker. Wings tinted, with a distinct apical shadow, veins and costal cells yellow. Cell R_5 open, no spurveins. Subepaulets hairy. Halteres yellow.

Abdomen yellowish red basally, dark brown caudally, all but the seventh incisures pale yellow; mostly black haired, but with yellow hairs on the incisures and median patches which extend forward of the middle on tergites 4 to 6. Venter uniformly reddish with yellow hairs.

Holotype.—A female, Sibuyan Island, collected in 1927, by C. F. Baker. In United States National Museum.

Paratypes.—Eleven females, same data as holotype (in USNM, CNHM, and collection of CBP). In close agreement with the holotype except in size, which varies from 11 to 14.5 mm.

Remarks.—Named *provocans* because it was so provoking to find in these small collections still another species that required description.

Tabanus rossi, new species

A medium-sized species with chestnut brown abdomen and median row of white-haired triangles, front broader than usual with black callosity broadly touching eyes; compact, black antennae with enlarged dark red scape and reddish legs.

This species is closest, in the Philippine fauna, to *T. provocans,* new sp., but is quickly distinguished by the key characters and the callosity not tapering broadly into the median callus. Specimens of this could also have been responsible for the *T. factiosus* Walker records credited to Negros, but that species has narrower front with callosity not touching the eyes, antennal plates reddish basally, pale yellow beard and longer, yellow palpi.

Description (holotype, female).—Length, 14 mm. Eyes bare, unbanded, sea-green (relaxed). Front parallel sided, index 1:5.0, dark, ashy gray with a chocolate brown, black-haired patch at vertex; callosity piceous, taller than broad and suddenly narrowed into a linear, black keel which reaches to the upper third of the front. Subcallus gray pollinose with a narrow dark brown band under the callosity and a brown shadow across the base of the antennal fossae (as in *provocans*). Face and cheeks, including beard, whitish pollinose and pilose. Scape enlarged, hood-like, taller than plate, dark red with dense black hairs above; third segment black, the plate less than half again longer than wide, the dorsal angle obtuse, the annuli heavy, and shorter than plate. Palpi whitish, swollen basally; attenuated apically with black hairs on front and sides.

Notum and scutellum dull blackish with gray bloom anteriorly, no distinct lines, covered with scattered black and appressed deep brassy hairs; pleura, chest, and coxae whitish pollinose and pilose. Legs red, femora covered with white hairs, the fore pair a little darker due to gray bloom, tibiae with mostly reddish hairs, darker distally on the fore pair and in the hind tibial fringe. Wings lightly tinted, a little deeper along the costal border, costal cells yellow; an inconspicuous cloud but no spur on the fork; cells R_5 wide open. Subepaulets hairy. Halteres orange.

Abdomen chestnut brown above, reddish below, darkening on the last four segments. A narrow V-shaped, integumental marking margins the scutellum and continues onto tergite 2 as a slender triangle in front of the pale triangle. The triangles cross about one-half to two-thirds of the respective tergites; pale creamy to whitish hairs on these and very narrow, lateral lines. Venter entirely pale-yellow haired.

Holotype.—A female, San José, Mindoro Island, collected March 13, 1945, by Ross and Skinner. In California Academy of Sciences.

Comment.—Named for one of the collectors, Dr. (then Captain) E. S. Ross, whose malaria unit facilities were generously placed at my disposal during my war-time, scrub typhus studies near the above location.

Tabanus reducens Walker

Tabanus reducens Walker, 1860, Proc. Linn. Soc. London, Zool., 4: 103—Celebes.

This large, distinctive species of the *striatus* complex was previously reported from the Philippines by Stekhoven (1926), based on specimens of both sexes from Mitzmain. It does not appear likely, however, that the latter used these flies when previously reporting (see p. 608) transmission tests of surra trypanosomes with *striatus*.

The more contrasting abdominal pattern, with discontinuous, ovoid, pale, sublateral spots confined to the second and third tergites, at once distinguish this species from *T. rubidus* below, which has not been reported from the Philippines. In one of the Osmeña females, the hind tibial fringe is predominantly whitish haired in the basal half.

Material examined.—Two females, Osmeña, Samar, collected May 10, 1945 (LER); one male, Olongapo, Samar, collected June 29, 1945, in tent (LER); one female, Osmeña, Samar, collected April, 1945 (USNM); one female, Los Banos, Luzon, collected October, 1945, by B. Malkin (USNM); 4 females, Manila, collected December, 1945, and February, 1946, by H. Hoogstraal; 2 males, 2 females, Manila, Luzon, collected August, 1945, at light (CBP); one female, Manila, collected April 2, 1955 (LER); several females, Mindanao and Luzon (USNM); 2 males, Los Banos, Luzon, det. by Bezzi (USNM); one female, Mount Makiling, Luzon, collected in 1927, by C. F. Baker (USNM); two females, Palo and Uta, Leyte, collected June 25 and November 17, 1957, respectively, by W. C. Frohne; one male, San José, Mindoro, collected March 13, 1945, by Ross and Skinner (CAS).

Remarks.—This species is thus on the wing in the Philippines nearly all the year round.

Tabanus rubidus Wiedemann

Tabanus rubidus Wiedemann, 1821, Dipt. Exot., p. 69.

Kröber (1924) has reported this species, widespread in the Malaysian region, from the "Philippinen" without more definite locality. Since it is strangely absent from collections from Borneo, its presence in the Philippines will need to be confirmed.

Tabanus striatus Fabricius

Tabanus striatus Fabricius, 1794, Ent. Syst., **4**: 371—China and Java.

Tabanus manilensis Schiner, 1868, Reise Novara Dipt., p. 84—Manila.

?Tabanus strophiatus Surcouf, 1923, Bull. Soc. Ent. France, **1923**: 197.

The considerable synonymy of this very common and variable species in the Orient is much confused. Ricardo (1911) lists eight synonyms; Stekhoven (1926) reduces these to four and he disregards *T. manilensis* and *T. strophiatus* completely. Many of the names are associated with the apparently variable feature of whether the median, abdominal line encroaches on tergite 2, and this in turn also obviously depends, in the limited material that I have seen, on state of preservation and sex.

Ricardo (1911), Austen (1922), and Surcouf (1923) have discussed this species, each with different ideas of its composition. Obvious discrepancies and contradictions in descriptions are found in keys and figures in the latest review by Stekhoven (1926), who compares this species with *T. tenens* Walker (=*T. triceps* Thunberg), a close relative, to which he has wrongly, I believe, transferred *T. hilaris* Walker

from synonymy with *T. striatus*. The types seen (BMNH) of *T. hilaris*, *T. partitus* Walker and *T. ruficallosus* Bigot all appear to be variants of *T. striatus*.

I have also studied the types of *T. striatus* and *T. manilensis* through the courtesy of Professors S. L. Tuxen of Copenhagen and Max Beier of Vienna, respectively; neither type is in good condition. If the Philippine material is considered distinctive by a future reviewer, then the latter name is available for this population. Mitzmain's studies (1913, 1914) were accomplished with what he called and figured as *T. striatus* and my Philippine material of both sexes does not differ substantially. Unfortunately, interpretations by the several students above on the identity of *T. striatus* have been based on Fabricius' meager description without crucial study of the type female from China. The type is a worn specimen with flagellums missing; front practically parallel-sided, the red, quadrangular callosity filling the lower third and with a spindle-shaped median callus; fore tibiae concolorous reddish (possibly faded) but femora all darker than tibiae; abdomen with wide, pale median stripe on tergites 3 to 6, the sublateral lines attenuated on tergite 4. The type female of *T. manilensis* does not disagree significantly from the type of *T. striatus* except that the fore tibiae are brown distally. The front is slightly narrowed below, index 1:6.8. Stekhoven (1926) lists an unusual latitude in frontal index of *striatus* as 1:3.8 to 7.0.

I have seen small series of both sexes from India, Burma, Thailand, and Malaya; they agree with variations seen in present Philippine material. In all, the fore femora, about the distal third of fore tibiae, and usually the notum are dark; the bases of the two hind pairs of femora are variably darkened; the remainder of the legs is reddish. In females, the frontal callosities, for the entire lengths, fill the lower third of fronts. The annuli are usually, not always, blackish or dark brown. The median stripe is either interrupted at tergite 2 in many males, but in only one Philippine female, or is projected narrowly across this tergite in many other males and most females (poor condition makes this difficult to determine in both the above types, but the stripe definitely appears to encroach on tergite 2 at least in *manilensis*). Infrequently, a female shows this line hardly narrowed on tergite 2. The dark medio-ventral line varies from faint in certain lights to distinct, but is seldom absent unless worn or obscured.

This variation, at least as regards the Philippine material, raises serious doubt as to the validity of Surcouf's proposal of *T. strophiatus* for "*striatus* auctorum" based solely on the presence of the median

band on tergite 2. His synonymy also varies from that of Austen (1922) and Stekhoven (1926).

Philippine material examined.—One male, 22 females, Manila, Luzon, collected December, 1945, to February, 1946, by H. Hoogstraal (CNHM); 1 male, 3 females, same locality, Bureau of Agriculture, Philippine Islands (probably original Mitzmain series (USNM); 1 male, 2 females, same locality, collected in August, 1945, at light (CBP); 1 female, same locality, collected February 19, 1929, by G. Linsley (CAS); one male, 2 females, Alabang, Rizal, Luzon, collected December 9, 1945, by B. Malkin (USNM); 2 females, Quezon City, Luzon, collected September 7, 1954, by Diliman (LER); 1 female, Nichol's Field, Luzon, collected in August, 1945, at window (CBP); 1 male, Mount Makiling, Luzon, collected in 1927, by C. F. Baker (USNM).

Two females, Subic Bay, Olongopo, collected by J. C. Thompson (CAS); 3 females, same locality, collected in June, 1945, carabao trap; 4 males, same locality, collected June 29, 1945, at light (LER).

Nine males, 1 female, Pikit, Cotabato Province, Mindanao, near sea level, collected December 15, 1946, at light, by F. G. Werner (CNHM); 1 male, Davao City, Mindanao, collected October 24, 1946, at light, by H. Hoogstraal (CNHM); 1 female, Zamboanga, Mindanao, collected in September, 1945, by J. Laffoon (USNM).

One female, Palo, Leyte, collected December 13, 1944, near rice paddy, by S. G. Jewett, Jr. (USNM); 1 male, 2 females, Tacloban, Leyte, collected May 6, 1945, by E. S. Ross (CAS).

One male (at light), 1 female (on carabao), Osmeña, Samar, collected July–August, 1945, by J. Laffoon (USNM); 6 females, same locality, collected May 4–5, 1945, in tent (LER); 1 male, same locality, collected May 10, 1945, at light (LER).

Two females, Victoria, Negros Occidentale, collected January 14, 1928; 1 female, same locality, collected December 12, 1927, at light (USNM); 2 females, San José, Mindoro, collected February to October, 1945, by E. S. Ross (CAS).

Remarks.—A study is needed of the variation that occurs within this species in various Oriental localities. Such a study should include rearing. It appears that larvae are seldom encountered in nature, but egg masses are readily obtained from blood-engorged females.

Mitzmain (1913, 1914) has studied the biology of this species, and demonstrated its potentialities as a mechanical disseminator of surra pathogens, an important disease of livestock. Though these flies prefer carabao, they are a serious pest of all livestock, but even where prevalent, they have never been observed to attack man.

Kelser (1927) reviewed and expanded the evidence indicating that (1) tabanids, chiefly *T. striatus*, are mechanical but not biological vectors of surra trypanosomes; (2) cattle and carabaos, which are carriers of the trypanosomes, are not affected "unless normal resistance is lowered." In the Philippine area sampled he found that 50 per cent of 141 carabaos and 22 per cent of 54 cattle carried these organisms.

Tabanus triceps Thunberg

Tabanus triceps Thunberg, 1827, Nov. Acta Upsal., **9**: 59—"Cayenna et Brasilia."

Tabanus tenens Walker, 1850, Ins. Saund. Dipt., **1**: 49—East India (new syn.).

Tabanus megalops Walker, 1854, List Dipt. Brit. Mus., **5**, Supp. 1, p. 247—Java (new syn.).

Tabanus sinicus Walker, 1848, List Dipt. Brit. Mus., 1: 163—China, Hongkong (new syn.).

This has often been confused with *T. striatus*. Ricardo (1911) and Surcouf (1923) included this as a synonym of *T. striatus* and the latter author separated *T. partitus* Walker (from Singapore) with "pattes sombres," a character on which, in part, Stekhoven (1926) and Austen (1922) distinguished *T. tenens* from *T. striatus*.

The confused status of *T. tenens*, even though it is now recognizable as distinct from *T. striatus*, makes it inadvisable to apply to the International Commission to quash the older *T. triceps*.

Through the courtesy of Professor Bertil Kullenberg of Uppsala Museum, the three syntypes ("α, β, γ") were studied on loan. The first, "α," is best preserved and most recognizable but unfortunately it cannot be Neotropical and most closely approaches *T. tenens* of the Orient, as concurred in by Mr. H. Oldroyd. It is the only one of the three that has thorax with "lineis quinquealbidis" of the original description and this character in the description is the only one that can distinguish the three syntypes. The eye pattern (relaxed) was without stripes.

The second syntype, "β," is undoubtedly Neotropical, but belongs in the difficult "*curtus* group" of Fairchild in *Taeniotabanus*, and is closest to *pallidefemoratus* Kröber and *colombus* Fairchild with unlined thorax. The eyes (relaxed) had the usual *Taeniotabanus* bands. The third syntype, "γ," is moldy and the poorest of the three, but it also is obviously Neotropical, though not certainly identifiable.

It is obvious, in spite of the locality discrepancy, that the "α" syntype should be designated the lectotype, which brings *T. tenens*

Walker into synonymy on the basis of the unbanded eyes, narrowed frontal callosity above, brown-lined notum and unicolorous, reddish legs.

A male from the Bengal series mentioned below, which differs from *T. striatus*, was compared with the male types of *T. megalops* Walker and *T. sinicus* Walker without showing significant differences (new synonymy). Both had been placed as synonyms of *T. striatus*, but Stekhoven (1926) had revived *T. sinicus* on the basis of a lack of the black band across the eyes, a character which also fails in some *T. striatus* depending on preservation.

A series of both sexes from Bengal, India, collected by Dr. M. Cazier, appears to confirm the distinctness of *T. triceps* on characters given in the key, a conclusion with which Oldroyd (1957) is in agreement. One of the females was compared with the type of *T. tenens*. None of the females has the callosity contiguous with the eye margins for its entire length, but all have spindle-shaped median calli contrary to Stekhoven's description but not his figures. The differences in shapes of fore tarsal segments stated by Austen are not apparent in these specimens. The antennae, legs, and venter of all are more uniformly reddish than in *T. striatus* and the average size is distinctly larger. Occasional females have an orange but not dark midventral line.

Specimens of this species from the Philippines have not been seen, though its presence is possible since the related, less common *T. jucundus* occurs as far west as Ceylon.

Material examined.—Two males, 20 females, Kanchrapara, Bengal, India, various dates in June, 1944, M. A. Cazier. In American Museum of Natural History.

Remarks.—Two females of typical *T. striatus* were also taken in the same locality but dated May 31, 1944. Intergradation was not apparent.

Tabanus jucundus Walker

Tabanus jucundus Walker, 1848, List Dipt., **1**: 187—Hongkong.

This is obviously of common ancestry with the common *T. striatus* discussed above. It is at once distinguished by the wide fronts and protuberant callosities in the females, the lined thorax and peculiarly lined abdomen. Stekhoven (1926) figures a diamond-shaped median callosity, and both he and Ricardo (1911) characterize the fronts as convergent below. In the specimens listed below, the front is strictly parallel and there is almost no median extension above the callosity. Nevertheless the other characters are in close agreement with this species previously recorded from Ceylon and India to Hongkong.

Material examined.—Four females, San José, Mindoro, collected in March, 1945, by E. S. Ross and F. E. Skinner (CAS).

Tabanus effilatus Schuurmans Stekhoven

Tabanus effilatus Schuurmans Stekhoven, 1926, Treubia, 6, (Suppl.), p. 145 (key), p. 154 (fig., pl.); 1932, Arch. Naturg., (N.F.), 1: 64.

The describer reported (1932) a specimen from Manila in the Hamburg Museum. Presence of this species on Luzon is confirmed by another female (CAS) labeled Subic Bay, July, 1907, Dr. J. C. Thompson. Only minor differences from the description are noted: the beard is straw yellow, the antennal tooth is more rectangulate and the mid-abdominal stripe a little broader and more even than figured, but the attenuated abdomen and other characters given in the key are quite distinctive. The appearance, especially of the front, suggests *T. triceps* Thunberg, which, however, has clear costal cells, unicolorous reddish legs and antennae, and less attenuated abdomen.

Tabanus effilatanus, new species (see p. 620)

Genus **Chrysozona** Meigen

Chrysozona Meigen, 1800, Nouv. class. mouches à deux ailes, p. 23.

Haematopota Meigen, 1803, Illiger's Mag. f. Insektenkunde, 2: 267.

Members of this genus are easily recognized by the small, slender, black and gray bodies, tinted wings with peculiar pale water markings, and wide black-spotted fronts in the females. No previously described species have been recognized among the material studied, though *C. lunulata* (Macquart) of the East Indies has been credited to the Philippines, probably on the questioned reference to this species by Osten Sacken (1882) (see p. 619).

KEY TO PHILIPPINE *CHRYSOZONA*

1. Antennae black; hind tibiae with only one basal ring. . .sp.? (Osten Sacken, 1882)
   Antennae with at least scapes reddish brown; hind tibiae with two pale rings, the distal of which is often not as plain as the basal. 2

2. Frontal callosity transverse, the paired spots discrete and isolated; fork and spur-vein usually with a compact circle of 4 spots around them. 3
   Frontal callosity strongly produced upward to a point in the middle, above which the paired spots coalesce to form a dark patch leaving only the upper fourth of the front gray; fork without a compact circle of spots. 4

3. Upper cheeks with a large black callus on each side and an isolated one between the antennae; wing spots reduced, only two transverse bars or paired spots each in the discal cell and two following medial cells, the apical band consisting of an even, crescentic, complete lunule. . . . . [*lunulata* Macq.][1]

[1] Credited to Philippines, but probably incorrectly (see p. 615).

Upper cheeks without calli, callosity produced downward between antennae; wing spots large and multiple, the apical band wavy and usually at least partially double, often incomplete or broken, discal and medial cells with 3 to 4 transverse bars (fig. 132)..... *abbreviata*, new sp.

4. Wing pattern reduced to small punctate spots, the apical band sickle-shaped, and no marginal pale triangles in marginal cells; scutellum mostly brown; scape and plate unusually thin (fig. 131)..... *volneri*, new sp.

Wing pattern also punctate but less reduced, the apical band wavy, broken, or complex, and with pale marginal triangles at outer corners of marginal cells; scutellum predominantly gray on disc when not discolored; antennae slender but more robust (fig. 130)..... *monticola*, new sp.

Chrysozona monticola, new species. Figure 130.

This is a rather large, somewhat variable, dark brownish species with the wing pattern dark and reduced but an extensive pale area anteriorly and basad of the stigma, long, slender antennae, the scapes and plates subequal in length, the velvety-black frontal spots large and usually confluent, all tibiae with wide, white basal bands, and less distinct median ones on the two hind pairs. There is a peculiar, variable, contrasting gray figure on the scutellar-prescutellar junction, which is obscured in discolored specimens.

Close relatives in the East Indian area are not known. *C. cordigera* (Bigot) (syn. *fuscifrons* Austen) of Bengal has confluent frontal spots, a yellow band in the callosity above the antennae, and other characters in common, but the wings are gray to pale brown with a different pattern, the antennal scapes proportionately shorter, and the incisures more plainly gray margined than in *C. monticola*.

Description (holotype, female).—Length, 8 mm. Eyes bare. Front a little taller than broad, slightly convergent above, index 1:1.3 (based on median height), buff-gray pollinose in a band across the vertex, the remainder filled with the blackish, confluent frontal spots and the deep brown, protuberant, broadly heart-shaped, bare basal callosity; the small, upper black spot is almost surrounded by the more brownish, upper margin of the confluent paired spots; a peculiar, narrow, contrasting yellow-red, shiny band margins the callosity below, surrounding the antennal fossae. Face gray pollinose with sparse white pile, no prominent spots. Antennae very long, equal to length of notum minus scutellum, cylindrical and slender, scape red with no constrictions, equal to the plate in length, the latter subcylindrical and but little thickened basally, red on the extreme base grading to black distad of the apical two thirds. Palpi robust, dull brownish, with sparse black hairs but little shorter than the stylets, proboscis brownish black.

Notum, including scutellum and antealar tubercles, chocolate brown, unlined except for an abbreviated narrow yellow pollinose line anteriorly; around the prescutellum an irregular but bilaterally symmetrical, yellow pollinose figure consisting of an inverted half moon on the disc of the scutellum, above which are two tilted triangles with a short, diagonal lobe extending outwardly on the hind margin of the notum on each side. Pronotal lobes with brownish-yellow tinge. Pleura dull brown with yellow hairs. Fore coxae and tibiae sharply divided in color in the middle,

bright yellow basally and chocolate brown distally, hairs concolorous; two hind pairs of coxae and all femora unicolorous brown. Two hind pairs of tibiae brown with two yellow bands, the basal one broadest, and a similar one on first respective tarsal (metatarsal) segments. Fore tarsi black. Wings brown, the rosettes and spots reduced; costal cell and R_1 basad of the stigma entirely yellow, the first basal cell predominantly yellow in the outer half, the apical cross band double but both branches discontinuous behind their junction at tip of vein R_{2+3}, the outer one represented by a large spot just below the apex in cell R_4; a round spot without

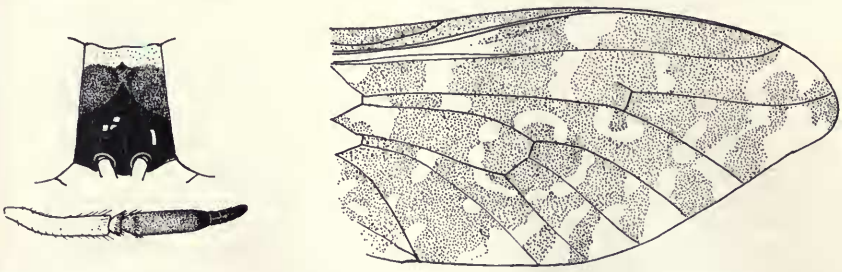

FIG. 130. *Chrysozona monticola*, new sp.; front, antenna, and apical wing pattern.

dark center at tip of stigma, and all marginal cells with yellow triangles at the outer corners. Spur-veins present. Subepaulets small, scale-like, with only two to three bristles. Halteres orange yellow.

Abdomen chocolate brown, no pattern except for narrow yellow incisures above. First tergite laterally without gray expansion of incisure.

Holotype.—A female, Mount Makiling, Luzon, collected in 1927, by C. F. Baker. In United States National Museum.

Paratypes.—Eight females, same data; length, 8.5 to 10 mm. (in USNM, CNHM, and collection of CBP). Vary in minor respects: the callosities may grade to reddish below without the sharp, narrow band above the antennae, the prescutellar figure and the broad gray figure on the scutellum may be obscured by discoloration, the incisural bands may entirely disappear, and the double, apical cross bands may be more nearly complete. The pale spots and marginal triangles in a few specimens are more reduced than in the type, approaching the following species in appearance.

Remarks.—It appears probable that Kröber's (1924) "*Chrys.* spec. (aff. *irrorata* Macqu.)" is the same as this. He gives no locality other than "Philippinen."

Chrysozona volneri, new species. Figure 131.

At first sight this appears to be but a variant of the preceding, and it does have the same color and general appearance which includes

wing color, leg pattern and slender antennae. Though the paired, frontal spots are large, they do not coalesce; there is a small dark pollinose spot on the upper face under the antennae; the scutellum has only a suggestion of a small gray spot on the disc; the apical wing bands are single and complete to both margins; there are no pale triangles along the hind margins; and there is a small spot immediately in front of and another behind the fork at the juncture of vein R_4 with R_5 neither of which is evident in any of the preceding species.

Description (holotype, female).—Length, 9.5 mm. Front taller than wide, narrowed above, index 1:1.4, gray-brown pollinose, the median spot isolated above the upper margins of the paired spots which are separated by less than their own widths and fill the lower corners, touching the ocular and callosity margins broadly; callosity deep mahogany brown grading to more reddish around the antennal fossae, including the space between them, shaped as in the preceding species. Face and cheeks buff-gray pollinose and sparsely creamy pilose, paired brown shadows above the oral margin and an irregular, small sooty spot on the upper face. Antennae and palpi similar in proportion, shape, and color to the preceding but the scapes and plates even thinner in diameter.

Thorax and legs colored as in the preceding but the prescutellar gray spots reduced to a narrow, transverse, double crenulate line along the hind margin of the notum and the gray spot on the scutellum smaller, indefinite, and triangular. Pleura pinkish gray, a brown, longitudinal line along the suture behind the forecoxal bases. Wings brown, also with a paler area behind the costa basad of the stigma, but the first basal cell is predominantly brown with two pale bars, and the round spot just beyond the stigma has a dark center; the apical cross-band is narrow, crescentic, and has a short hook at the hind margin; the spots and rosettes in the outer wing are even more reduced than in the preceding species, and there are no marginal triangles or yellow spots.

Abdomen also chocolate brown, no pattern, but the incisures have contrasting gray bands both above and below, that on the first tergite expanding laterally to encompass the whole side of the tergite.

Holotype.—A female, Samar, collected in 1927, by C. F. Baker. In United States National Museum.

Remarks.—It is possible that intermediate forms taken with further collecting will reduce this to a subspecies of *monticola*, but at present the differences are in characters of front and wing pattern which have not shown this much variation in one species of this genus from other areas.

The species is named for J. H. Volner, United States seaman who contracted scrub typhus on Guiuan Peninsula, Samar Island, during World War II, and from whom the first strain was isolated in the Philippines (see Philip, Woodward, and Sullivan, 1946). This strain was later used for vaccine trials by the United States Army in Japan.

It is probable that the *Haematopota* "sp.?" from the Philippines, mentioned by Osten Sacken (1882), included this or the preceding

species, since he mentions basally reddish antennae, hind tibiae with two rings, and compares the wings to those of *C. lunulata* (Macq.). Other specimens he mentions, with entirely black antennae and only one basal ring on the hind tibiae, represent a species not present in the collections under study here. His comparing it with *C. lunulata*, however, is probably the unjustified basis on which Surcouf (1921) and Kröber (1924) included the Philippines as a locality.

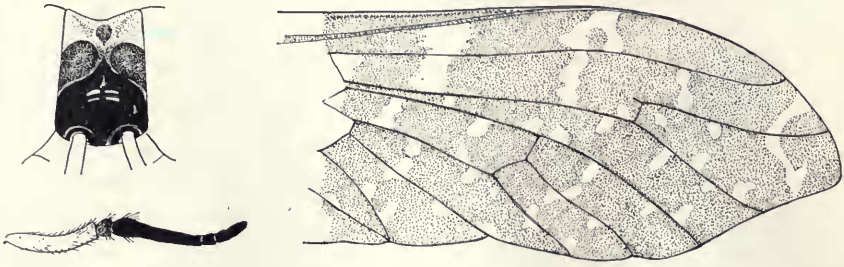

FIG. 131. *Chrysozona volneri*, new sp.; front, antenna, and apical wing pattern.

On the other hand, the more robust, blacker antennae make association here of "*Chrysozona* spec. ♀ (aff. *dissimilis* Ric.)" (Kröber, 1924) doubtful.

Chrysozona abbreviata, new species. Figure 132.

This is a rather small, delicate, dark brown species with slender antennae, wing markings numerous and broken into spots, the apical cross-bands double but often incomplete, and two hind pairs of tibiae double-ringed. It differs from the two preceding species in the heavier wing and abdominal patterns, shallower, more transverse callosities, smaller frontal spots, and more reddish halteres. The species is related to *C. fumigata* (Sch. Stek.) of Java, but that species has no median, frontal spot, more robust scape and plate, the scape is relatively shorter, there is a dark spot on each upper cheek, and the wing markings are more connected, less broken into spots.

Description (holotype, female).—Length, 7.0 mm. Front grayish buff pollinose, taller than broad, index 1:1.3, noticeably convergent above, the vertex deeply concave, the median spot small, rounded, blackish, the paired spots larger, rounded, and touching both the eye margins and basal callosity; the last is piceous, transverse, contiguous to eye margins, and tridentate around the antennal fossae, thus eliminating the usual velvety spot between the antennae. Face and cheeks gray pollinose and sparsely pale pilose, without punctations or spots. Antennae reddish, darkening apically, long and slender, the scape without apical notches and the

length a little less than the width of the callosity, the plate but little thickened basally and nearly as long as the scape. Palpi reddish, somewhat thickened basally and with shaggy black hairs.

Thorax gray brown on the notum and scutellum, with abbreviated dark lines anteriorly, suggestions of gray pollen around the prescutellum, and the whole covered with appressed brassy hairs. Pleura gray pollinose, whitish pilose, with two narrow, longitudinal, brown lines along the sutures. Legs brown, with paler rings

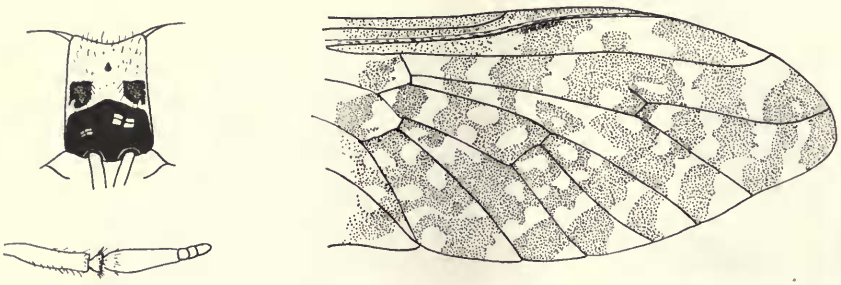

FIG. 132. *Chrysozona abbreviata*, new sp.; front, antenna, and apical wing pattern.

at the bases of the fore coxae and fore tibiae, and a pair on each of the middle and hind tibiae, the basal one most distinct on the hind pair. Wings brown with the spots numerous and discontinuous, rather obscuring the arrangement of rosettes, the apical crossband double behind a common junction at the tip of vein R_{2+3}, both branches sinuous and complete to the hind margin of the wing, the outer corners of the posterior cells with discontinuous triangular plate, spots along the wing margin. Spur-veins present. Subepaulets small, scale-like with two to three black bristles. Halteres dull reddish yellow.

Abdomen dark brown above, with narrow gray incisures expanding forward along the lateral margins to form a continuous line, but no triangles or spots on the tergites centrally. Venter blackish, the incisures almost imperceptibly paler.

Allotype (male): Like the female except for the usual sexual differences, and readily associated. The area of enlarged facets is bare, occupies the upper three fourths and is sharply demarcated. There is a rounded, velvety-brown spot on the gray subcallus. The scape is relatively thicker than the flagellum compared to that of the female. The incisures are not as prominently pale though this also varies in the females.

Holotype.—A female, Manila suburbs, Luzon, collected June 15, 1945, by C. B. Philip, on carabao. In the collection of the author.

Allotype.—A male, San José, Mindoro, collected in May, 1945, by Ross and Skinner (CAS).

Paratypes.—Length, 7–10.5 mm. One female, Luzon, collected in June, 1945, by C. B. Philip; 2 females, Manila, carabao trap, collected June 26, 1954, by L. E. Rozeboom; 2 females, Balara, carabao trap, collected July 16, 1954, by L. E. Rozeboom; 1 female, Manila,

collected September 16, 1954, by L. E. Rozeboom; 1 female, Santa Rita, Subic Bay, collected July 25, 1954, by L. E. Rozeboom; 1 female, Mount Banahao, collected in 1927, by C. F. Baker; 1 female, Mount Makiling, Luzon, collected in 1927, by C. F. Baker; 1 female, Los Baños, collected May 18, 1955 (in collection of LLP); 4 females, San José, Mindoro, collected in May, 1945, by E. S. Ross (in USNM, CNHM, and collections of CBP and LER).

The median frontal spot varies in size; it is almost completely absent in some specimens. The antennal plates are predominantly blackish-brown in several specimens. The apical cross-band of the wings is sometimes incomplete in either the inner or outer branches, and in two larger specimens (10 mm.), which are otherwise indistinguishable, there is a suggestion of an indistinct pale pollinose median triangle on tergite 2, of indefinite pale lateral spots on the last three tergites, and of gray thoracic lines anteriorly. The outer of the two pale bands on the hind tibiae is less distinct in some specimens than in others. The callosity in one is reddish brown, and in others may be bluntly produced upward between the paired spots.

Remarks.—The above three Philippine species are obviously derived from a fairly recent, common ancestral stock.

Chrysozona sp.

There is in the British Museum (Natural History) a female labeled "Philippine Is., Irisan, Banquet Prov., Luzon, 1906–44, May 29," which appears to belong to yet another species, but lack of the middle and hind legs prevents placement in pertinent keys. The front and antennae resemble *C. abbreviata,* n. sp., but the wing pattern is reduced much as in *C. volneri,* n. sp., from which it differs in the apical cross-band broken into three small spots; also, there are small, pale, marginal triangles in all cells but M_3. This may be a variant of the latter species or of *C. pungens* (Dol.) of Malaysia. It has some characters in common with *C. equitibia* (Sch. Stek.) of Sumatra, which, however, has heavier, inner markings on the wings, and black spots between the antennal fossae and on each cheek. The status of this specimen cannot be settled at this time.

UNCERTAIN PHILIPPINE SPECIES

Tabanus(?) flavipennis (Macquart)

Diabasis flavipennis Macquart, 1850, Dipt. Exot., Suppl. 4, p. 35.
Tabanus flavipennis Fairchild, 1956, Smithson. Misc. Coll., 31: 16.

The original description states "des iles Philippines, M. Bigot" but there is the probability of the same inaccuracy here as was called to my attention by Oldroyd (1947, and correspondence) for *Chrysops testacea* Macquart "de la Tasmanie, M. Bigot," since the introduction to Supplement 4 lists neither of these countries among those from which Bigot obtained material. The type (with a label in Macquart's hand), the characters of which are badly obscured by an adhesive, and another specimen from the same stated locality, were both considered by me as being probably of Neotropical origin. The second specimen is close to or the same as *Diachlorus curvipes* (Fabricius) from South America. Though the type has a few hairs toward the tips of the subepaulets, it appeared to relate to some intermediate species of Neotropical *Stenotabanus* on account of the rounded, not angulate, upper margin of the antennal plate. At least nothing like it occurred among Philippine material reported here.

On the other hand, Fairchild (op. cit.) believes that the type is a *Tabanus* and that the name "should not be added to the Neotropical fauna without further evidence."

In addition, *Chrysops flavocincta, Chrysozona lunulata, Tabanus factiosus, T. fumifer, T. 5-triangularis, T. immanis, T. rubidus,* and *T. triceps* are discussed in text above either as not certainly recognized, or as possibly to be found in the Philippines eventually. *Chrysops clavicrus,* the identity of which is in doubt, has been reported by Kröber (1929) from Palawan.

SUMMARY

New records of Tabanidae are provided from the Philippine Archipelago, represented chiefly in the collections of Chicago Natural History Museum and the U. S. National Museum. Described as new and figured are: *Cydistomyia insol* (holotype male, Panay), *C. pechumani* and *C. parasol* (holotype females, Negros Orientale), *C. abava* and *C. frontalis* (holotype females, Mindoro), *C. absol* and *Tabanus pseudixion* (holotype males, Mindanao), *T. pallidiscutum, T. mindanensis, T. brevicallus, T. confusiens, T. wenzeli, T. attenuis,* and *T. neoindianus* (holotype females, Mindanao), *T. baguiensis, T. auripilosus, T. luzonensis,* and *T. alticolus* (holotype females, Luzon), *T. cnemidotus, T. palawanensis, T. subjoidus* and *T. subimmanis* (holotype females, Palawan), *T. bakeri, T. samarensis* and *T. unifasciens* (holotype females, Samar), *T. provocans* (holotype female, Sibuyan), *T. pellus* (holotype male, Negros Occidentale), *T. negritos* and *T. rossi* (holotype females, Mindoro), *T. hoogstraali* (holotype female, Busu-

anga), *T. conius* (holotype male, Biliran Island), and *T. anomalus* (holotype female from Philippine Islands, unspecified), *Chrysozona monticola* and *C. abbreviata* (holotype females, Luzon), and *C. volneri* (holotype female, Samar). Nomenclatural changes are: *T. megalops*, *T. sinicus*, and *T. tenens* Walker equal *T. triceps* Thunberg. *T. vanderwulpi* Osten Sacken is revived from synonymy of *T. flexilis* Walker (syn. *T. pictipennis* van der Wulp). Keys to the four genera and fifty reported species of Philippine Tabanidae are provided.

ADDENDUM

While the preceding review was in page proof, the report on Philippine Tabanidae by Kröber (1924), which had been overlooked by myself and others, was discovered too late to revise keys and to insert more than brief references to his records of additional species. From "Philippinen," without locality, he adds *Chrysops fixissima* Walk., *Chrysozona lunulata* (Macq.) (which had been previously questioned, as stated in above text), and two other unnamed species of *Chrysozona*, *Tabanus univentris* Walk., *T. flaviventris* Big. (♂), *T. rubidus* Wied., and *T. fumifer* Walk. By inference from the title and introductory remarks, but without even statement of "Philippinen" under the species, he further describes "*Erephopsis* spec. ♀," *T. philippinensis* n. sp. ♀, *T. griseoscutellatus* n. sp. ♂, *T. malayensis* Ric. and *T. melanopygatus* Big. (which he suggests on the basis of his studies may have to be removed from previous synonymy with *T. fulvimedius* Walk.). Because he also redescribes other species previously assigned to the Philippines by other authors, there is no way to ascertain which Philippine specimens he saw.

Principal interest lies in his incompletely described "*Erephopsis* spec. ♀," and it is most unfortunate that no locality is given, for the yellow hairs on the thorax would appear to relate the species to the New Guinea, bare-eyed species of *Scaptia* discussed by Oldroyd (1947, Proc. Linn. Soc. N. S. Wales, **72**: 125–142) rather than to the hairy-eyed *Nuceria* spp. of the Asiatic continent. His lack of mention of this character of the eyes suggests that they were bare. The species is apparently a dark brown one with golden to pale yellow-haired thorax, white beard, tinted wings, and proboscis over half the length of the body. If assignment to the Philippines is correct, then a species of the more primitive subfamily Pangoniinae has invaded this fauna, possibly from the direction of New Guinea.

Apparently Kröber had only males in the specimens he assigned to *T. flaviventris* Big., wrongly, I believe, because of the gray beard, entirely yellow-haired palpi, and yellow-tinted wings. This male might be a *Cydistomyia* but it does not entirely agree with any species previously discussed, while the somewhat similar *T. auripilosus* n. sp. differs in dark antennal styles and fore legs, and golden-yellow beard.

I have not seen specimens agreeing with Kröber's redescription of *T. univentris* Walk., a large (20 mm.) yellowish species from which Kröber's specimen(s) differs critically in smaller size (16–18 mm.), white beard, red antennal plates, gray-black rather than brown thorax and femora, and plain abdomen without midventral dark stripe. This species appears to be too large to be a *Cydistomyia*.

Kröber's redescription of *T. malayensis* Ric. makes his assignment of it doubtful because of narrower front, white beards, and median abdominal triangles which are the expansions of pale incisures. I cannot place his species in the Philippine *fumifer* group to which his *T. philippinensis* belongs. The uniformly red-brown legs (including fore tibiae) might relate the latter to my *T. unifasciens* n. sp., but the type(s) would need to be studied to check for the unmentioned single eye stripe, brown band across the upper subcallus, and differently patterned abdomen above and below.

Since there are some discrepancies in the description of specimens Kröber assigned to *T. melanopygatus* Bigot, originally from "Indie orientale," restudy of his material is obviously needed before the species is credited to the Philippines. The full-width callosity would bring the specimens to couplet 27 of the foregoing key to *Tabanus*, where the combination of size under 15 mm., frontal index of 6, black femora, and median, yellow-haired triangles should be distinctive. I have not recognized the species.

Kröber also redescribes six other species already known from the Philippines and seen by him in small collections from Berlin-Dahlem and Berlin-Wilmersdorf.

Tabanus effilatanus, new species

A dark species with red antennae, clear wings but deep yellow costal cells, and dark brown abdomen with a median buff gray stripe and two sublateral, irregular reddish ones, attenuated behind tergite 3.

This was at first considered to be a dark variant of *T. effilatus* Sch. Stek., and there is no way to know which of these forms was respon-

sible for Stekhoven's 1932 Philippine record. However, the Subic Bay female was restudied and found to agree with true *effilatus* from Malaya and to differ specifically from the present specimen taken on the other side of the Archipelago. *T. effilatanus* differs in blacker, rougher callosity, more slender elongate antennal plates, paler, blunter palpi (which are deep flesh-colored in *effilatus*), golden hair on thorax and elsewhere, and blackish femora and midventer. *T. effilatus* is a browner insect, including femora and callosity, and the venter is entirely yellow-haired on the first four sternites.

Description (holotype, female).—Length, 18 mm. Eyes bare, black, unbanded, with bluish-green sheen (relaxed). Front golden pollinose, more grayish, with black hairs at vertex, moderately convergent below (index 1:7.3); callosity black and somewhat rugose with irregular lower margin and irregularly tapered above into an attenuated keel which reaches to upper third of front. Subcallus creamy pollinose, the face and cheeks white pollinose and pilose. Antennae brick red, the style sharply black, with black hairs on the basal two segments, the plate more slender and elongate than in Malayan *effilatus*, deeply excised, the dorsal tooth rectangulate. Palpi pale gray with black hairs, not as slender and more blunt than in *effilatus*.

Notum and scutellum blackish, with three obscure, brown lines and some gray pollinosity anteriorly, covered with appressed golden, and scattered black hairs. Pleura gray with creamy to white pile. Femora blackish gray with pale pile, and golden hairs increasing dorsally and apically on the last two pairs. Tibiae reddish brown darkening apically with mixed black and golden hairs, the hind tibial fringe black. Wing veins darker brown than in *effilatus*, all marginal cells open, no spur vein. Halteres bright yellow.

Abdomen darker than in *effilatus*, the lines plainer, the median one a little wider and crossing tergite 5, and attenuated on 6, widened slightly at each incisure and with yellow to golden hairs; tergite 7 unusually extruded, equal to each of the two preceding. The brick-red, sublateral lines, jagged and heaviest on tergite 2, fading to two small spots on 4, covered with golden to rufous hairs. Edges of tergites broadly pale yellow with concolorous hairs, not widened on incisures. Venter blackish with black hairs, merging to brownish-red and golden to yellow hairs on sides of first 3 sternites.

Holotype.—Calicoan Island (at south end of Samar), Philippines, March, 1958, F. F. Bibby. In United States National Museum.

This species should be added to the key (p. 561) as couplet 18b, as follows:

18a. Abdomen markedly attenuated caudad, the median stripe even, antennae red, style and femoral bases darkened, costal cell yellow.....18b

18b. Brown-bodied species, with brown callosity and femora, plates broad and but little longer than styles, palpi flesh-red and pointed, wing veins red, costal cells pale yellow, venter predominantly yellow-haired....*effilatus* Sch. Stek.

Blackish-bodied species including callosity and femora, plates slender and markedly longer than styles, palpi dirty gray and blunt, wing veins and costal cells brown, venter predominantly black-haired...*effilatanus*, new sp.

INDEX AND DISTRIBUTION

Only selected synonyms have been included. A few species mentioned in text from outside the Philippine Archipelago have been indexed as "exotic."

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